THE NEW! A CONTROL OF SAME AND A SA.95 CANADA SA.95

Ten is Hot!
And so is the Alinco DR-M03!

Ham PR at the Triathlon

CW = Fun! Read All About It

To Build: Audio Generator

•

On the cover: see page 36

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75 Amateur Radio Today

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QRX...

Special Bulletin for Those Who Think Uncle Wayne is Crying "Wolf!"

If you're one of the (albeit) minority who think that Wayne has been raising false alarums or cooking the numbers in some way, guess again.

Sorry, but here's some bad news. The Amateur Radio Service has stopped growing and could easily slip into a decline. So say the latest amateur radio census statistics published in the latest issue of Fred Maia's *W5YI Report*. According to Maia, growth in the number of United States ham radio licensees has nearly halted overall over the past year.

Fred told *Newsline* that his numbers exclude hams whose licenses have expired but remain within the two-year grace period. And while the overall number of U.S. hams is up by a bit over 3,000 over a year ago, it still only amounts to less than one-half of one percent in actual growth.

Only Techs showed any real increase, up by more than 10,500 from a year earlier. Tech Plus and Amateur Extras rose slightly, too, but Advanced and General were down slightly. The biggest percentage loss was among Novices. Their ranks declined by more than 5,000 operators over the past twelve months.

Thanks to W5YI Report, via Newsline, Bill Pasternak WA6ITF, editor.

Continued on page 8

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NEUER SAY DIE

Wavne Green W2NSD/1

w2nsd@aol.com



Mea Culpa

Yes, this is a combination January/February issue. Yes, all subscriptions (including lifers) will be extended a month. And, yes, this is all my fault. Mea culpa. I plead guilty - with an explanation, naturally.

You've noticed the thinning of 73. Well, since all of the other ham rags have been thinning too, as the ham industry has been slowly starving, maybe you haven't paid a lot of attention. A healthy magazine has to have about 50% advertising, with the other 50% of the revenues coming from circulation.

Since the only way a company can generate sales is by advertising or PR, the companies who react to a drop in sales by cutting their ad expenses are heading on an inevitable downward spiral toward bankruptcy. That's about the dumbest move a company can make. No, when times get tough, that's when survivors put even more effort into their PR and advertising. That's when they milk those reader service responses for everything they're worth. That's when they listen to their customers.

I, and 73, managed to survive the greatest catastrophe in the history of amateur radio, the monumentally stupid ARRL so-called Incentive Licensing proposal. That beaut killed ham equipment sales for over three years, putting almost 90% of the ham dealers around the country out of business, and virtually wiping out the entire American ham equipment industry. Gone were giants such as Hallicrafters. Hammarlund, meet a bunch of old men.

National Radio, Multi-Elmac, and a long list of others. No more Stancor, Thordarson, Barker & Williamson, Gonset, Sideband Engineers, Telrex, Clegg, Central Electronics, Lakeshore Industries, etc.

I watched the American giants topple, making the entry of the Japanese manufacturers to fill the vacuum easy. While the ARRL was trying to get the FCC to force the American hams off phone and back to CW, the Japanese pioneered the no-code license, resulting in a huge growth of Japanese hams, which fueled the growth of Icom, Yaesu, Kenwood, Standard, and the other Japanese manufacturers.

One unintended result of the ARRL proposal was the closing down of thousands of American school radio clubs (oops!), thus cutting off the entry of teenagers into the hobby. And since 80% of the teenagers who had become hams went on to careers in high-tech industries, this cut off the entry of tens of thousands of youngsters into our electronics industries. Meanwhile, the Japanese schools organized radio clubs, generating over a million new hams, which resulted in hundreds of thousands of hightech career-oriented youngsters. Our high-tech businesses were starved for engineers and technicians, while the Japanese companies had an endless supply.

When I visited Japanese electronics and computer research labs and factories, I was met at every turn by smiling Japanese hams, saying hello to W2NSD. When I'd give talks to American ham clubs, I'd

How much the League's 1963 Incentive Licensing proposal crippled our American electronics and computer industries can never be measured, but I'd say that this one incredible blunder cost our country trillions, as well as seriously hurt our military capability.

Ooops, I've digressed. First time.

At the same time as our ham industry has been cutting their advertising, making sure they'll not survive, I've been so busy doing other things that I haven't been paying much attention to 73 or raising hell with the industry over their self-destructive response to the drop in sales.

My year on the New Hampshire Economic Development Commission got me interested in finding out all I could about our school and health care systems. Extensive research showed me how our school system could be enormously improved, and run at a fraction of its current cost. And I found the same thing with health care. Indeed. I discovered that the cause of all illnesses has been known for years, but that the medical industry has been covering it up in order to make doctors and pharmaceutical and insurance companies rich. I decided it was time for me to blow the whistle.

Yes, ham radio is a lot of fun and it's provided me with a lifetime of adventure, but here was an opportunity to help millions of people to be healthy and add many productive years to their lives. So I dropped almost everything, including 73, to pursue this new goal — getting on talk radio and pushing my Secret Guide to Health book.

The Changes

Two volunteers are now working to repair the damage my neglect has caused. Dave Ingram K4TWJ, who should be familiar to you through his many articles, columns, and books, has stepped in to beef up the editorial end of the magazine, and Evelyn Garrison WS7A, the wonderful lady who helped make Icom a ham household name, will be selling advertising. Well, I haven't had the time I used to for selling.

Dave will be looking for lots of reviews of new ham gear, and Evelyn will be pestering the manufacturers to get us new gear to review. Let Dave know if you think you're qualified to be a reviewer and in which ham fields you're an expert.

Dave and I are interested in the same thing you are — we want to read about a piece of new ham gear and to be driven wild with desire. We want to know about the benefits and the fun we'll have. more than a list of the features. And we aren't much interested in a lot of technical data.

Speaking of fun, I enjoy reading about the fun other hams are having, whether it be something unusual in a Field Day effort, a mountaintop VHF expedition, or a DXpedition to some weird place. Or maybe a fiendish fox hunt situation. This is a hobby. It's for fun, so a ham magazine should be fun to read.

By combining the Jan/Feb issues we'll get back on schedule so that starting in March you'll get every issue in your hands by the first day of the cover month.

Yes, of course, I'll continue my editorials. We tried eliminating them for a couple of years and the circulation quickly plummeted, so we sure won't ever try that again.

With Dave doing the editorial work and Evelyn working to keep the industry from

Continued on page 37

LETTERS

From the Ham Shack

Bill Thim N1QVQ. In a recent editorial, you mention connecting repeaters to HF so no-coders could catch the HF bug. Here in Connecticut we have just such a system. It is administrated by the "Rocky Hill Donkey Dusters" club, with the callsign KB1CDI. We have one 440 machine, one 220 machine, three 147 machines, one 6 meter machine, one 10 meter FM machine, I-PHONE Internet phone, and the ability to dial up any HF SSB frequency 160-10 meters. It is a great incitement for no-codes to be driving to work while talking to DX stations via 10 meters or I-PHONE or both at the same time. Keep up the good work.

Great! But how about some articles on how others can do it, too? - Wayne.

Frank HL/N8HI (Korea). I just got a message from S.P. Kim HL1VXQ, the manager of KARL. In regards to Americans operating an amateur station here, one must submit an application 3 months prior to their planned operation. One copy of the amateur's license, and the specs in regards to the amateur gear to be used, rig, antenna, etc. The radio license fees: over 50 W is 100,000 Won per year, under 50 W, 80,000 per year. This data is to be sent to the Korea Amateur Radio League, 275-7 KEC B/D 6F, Yangjaedong, Seochoku, Seoul, Korea. They claim that it takes approximately 3 months for the application to clear, so it takes some planning. The recipient will use an HL preface followed by their callsign. I will ask them if they could put the application up on their Web page in English. Mike and I've been waiting since 1978 for this. Having the HL9 callsign all these years was OK, but one could not erect an antenna at their home without fear of being declared persona non grata or worse. As a result, many avid DXers had to go to a military base in order to operate. Cold winter nights, poor heating, hot summers, mosquitoes, very distant toilet facilities — it was a pain in the tush. Recently, all the old communications vans that we used for our ham stations have been taken away and bulldozed into sawdust, plus there is no longer an amateur radio club here in Korea. That's largely due to military ham being assigned to other fun places. Hi! With the help of a very nice gentleman, Dong Jeong HL1TSZ. the KARL Assistant Manager, the whole process took less than an hour. The application was multilingual, so there was no problem there, but is extensive, asking about one's final 6146 or such, PLL or what have you, frequencies anticipated, general run type info. They are in the process of converting their Web page to English, so the application will be available for downloading. Processing then should take around 20 days. The license will be good for one year, renewable, but then the fee is reduced to perhaps 30,000 won. Now all they need is a couple of hotels or motels with 5 over 5 stacked 20 meter beams on 'em, then watch the DXers converge!

The next time I'm visiting Seoul, I'll trade in my HL9WG call for an HL1. - Wayne.

Donald Pottorf. I'm looking for old 73s and other ham radio magazines that feature circuits to build. Any help out there? Please contact me at ECM Inc., 400 G Ave., Douglas AZ 85607; tel. (520) 364-4458.

Jim Giunta W3WA. I have been hoping that you would comment on the situation on 3950 MHz. I am sure you are aware of the controversy concerning the Liberty Net that meets every Saturday night a 10 p.m. Eastern time. I have listened many times to the comments made by those who participate, and although I do not always agree with what they say, I can see no reason why anyone, including the FCC, would want the net to cease operating. I understand that the net has been asked to justify its reason for operating. Have you every heard of the FCC asking any net to do this in the past? Doesn't the First Amendment also guarantee free speech on amateur radio? It was always my understanding that the Second Amendment was for the purpose of protecting American citizens from the government. If not the government, than who would it be that we are to be protected from? In your view, would it not be in the best interests of amateur radio for the FCC to concentrate its efforts on finding and eliminating the jammers who interfere with the net each and every week, rather than trying to dictate the content of what is said on the net as long as it is not profane or illegal? I look forward to your comments in your editorials.

Hey, when you're right, you're right! —

Les Warriner WA7HAM. Reference 73. pg. 8. October 1999, letter from Greg Hoover W8GH. I agree that it is a barefaced attempt by the FCC in concert with the ARRL to make all persons solely identified by a unique identifier, i.e., SSN/TIN. But the military has gotten away with it for years. When I first joined I had a "Service Number" (19195697). That number was normally preceded with an identifier as to branch, AF, RA, etc. Then they suddenly changed that system to the SSN of everyone. Now the tune of the powers that be seems to be another unique identifier such as an implant in the lobe of the ear, etc., which will be your identifier throughout life. To be implanted at birth much the same as the SSN is now being required on all newborns before they leave the hospital. When we get to the point that all will wear brown suits and have tattoos on our forearms, I wonder if anyone will wake up ...

I suspect that there may be no way to get the general public's attention away from sitcoms, ball games, and Judge Judy. It's strangely analogous to the games that distracted the Romans while their empire was being destroyed. — Wayne.

Gregg Hoover W8GH. Here is an update to my letter published in the October 1999 issue.

The Debt Collection Improvement Act of 1996 was ostensibly written to stem the high default rate for federal loans. The SSN demand is specifically authorized only for agencies to use in collecting and reporting on their loans in default. The law states that a federal agency can only demand a Social Security number (SSN) if a person is in a relationship with the agency that may give rise to a receivable due to that agency, such as a partner of a borrower in or a guarantor of a Federal direct or insured loan administered by the agency.

Each agency shall disclose to a person required to furnish a taxpayer identifying number under this subsection its intent to use such number for purposes of collecting and reporting on any delinquent amounts arising out of such person's relationship with the government.

From the start, I had a strong gut feeling

Continued on page 59

QRX . . .

Continued from page 1

More Changes for Hamvention 2000

More changes are coming to the Dayton Hamvention, as it plans its year 2000 event. The latest shift is in the hours of the flea market. Friday it still opens at 8 a.m. and closes at 6 p.m., but Saturday and Sunday will now also see an 8 a.m. start. For the past few years, 7 a.m. has been the opening of the flea market area.

Also, flea market sellers will now be required to be in place one half hour prior to opening. No more setting up as the crowds are coming in.

The Dayton Amateur Radio Association is also taking a hard-line stand on a tough moral issue. Effective with Hamvention 2000, there is a total ban on the sale of any and all adult materials.

And, lest we forget, The Dayton Amateur Radio Association no longer calls its flea market a flea market. Flea market sellers are now referred to as outside vendors. This is probably the result of combining the inside sales and flea market committees into one.

Thanks to WAØWRI, via Newsline, Bill Pasternak WA6ITF, editor.

FAR Scholarships

The Foundation for Amateur Radio, Inc., a nonprofit organization with headquarters in Washington DC, plans to administer seventy-three (73) scholarships for the academic year 2000–2001 to assist licensed radio amateurs. The foundation, composed of over seventy-five local area amateur radio clubs, fully funds ten of these scholarships with the income from grants and its annual hamfest. The remaining sixty-three (63) are administered by the foundation without cost to the various donors.

Licensed radio amateurs may compete for these awards if they plan to pursue a full-time course of studies beyond high school and are enrolled in or have been accepted for enrollment at an accredited university, college, or technical school. The awards range from \$500 to \$2500, with preference given in some cases to residents of specified geographical areas or the pursuit of certain study programs. Clubs, especially those in Delaware, Florida, Maryland, Ohio, Pennsylvania, Texas, Virginia, and Wisconsin, are encouraged to announce these opportunities at their meetings, in their club newsletters, during training classes, on their nets, and on their World Wide Web home pages.

 $\label{eq:Additional} \mbox{Additional information and an application} \\ \mbox{form may be requested by letter or QSL card,} \\$

postmarked prior to April 30, 2000 from FAR Scholarships, P.O. Box 831, Riverdale MD 20738.

The Foundation for Amateur Radio, incorporated in the District of Columbia, is an exempt organization under Section 501(C)(3) of the Internal Revenue Code of 1954. It is devoted exclusively to promoting the interests of amateur radio and those scientific, literary, and educational pursuits that advance the purposes of the Amateur Radio Service.

GM to Put Internet in Its Cars

General Motors Corp., the world's largest automaker, says that it plans to offer wireless Internet access in some vehicles within a year. This, according to the *Detroit News*, which says that plans call for a system that will allow a driver to check E-mail, surf the Web, and download data while cruising around town or over the nation's highways.

According to the article, GM will show a Cadillac Seville equipped with voice-activated Internet service that allows the driver hands-free access to the Internet via GM's Onstar communications and navigation system. The Detroit automaker had previously said it intended to offer Internet access in its cars, but Mark Hogan, president of GM's recently formed e-GM unit, made public when this will happen during an interview with the paper at the Tokyo Motor Show.

GM says that being the first to offer mobile Internet service will give the automaker a head start in the race to market online technology. Commenting on safety issues, Hogan said that the system really focuses on audio-based telephony where a customer can interact with the Internet via voice. That way, says Hogan, the

driver can concentrate on the main task, which is safely driving the car.

Thanks to GM, via Newsline, Bill Pasternak WA6ITF, editor.

The Mind is Immortal

According to Graham Kemp VK4BB of *Q-News*, contacts between the living and those who have already crossed over into the hereafter may be the ultimate form of communication. And the technology of the next century could make it possible for such QSOs to take place.

Business Week magazine has discussed 21 ideas that may be key to understanding the next century. One idea is the simulation of an individual's brain activity, making it possible for future generations to converse with a virtual equivalent of the person years after his or her death.

By the 2030s, technology may be developed to simulate a nervous system's electrical activity, allowing thoughts and feelings to be preserved. A person's life could be recorded using tiny video cameras housed in eyeglass frames. These cameras could be linked to IBM's newest hard disk, which is the size of a quarter and stores 300 MB, or one month worth of data.

IBM is also developing software to index video content automatically, allowing users to easily access a specific moment in their lives.

By 2099, a "Soul Emancipator" will be able to access the hard data and reconstruct a person's thoughts and feelings, allowing future generations to receive realistic answers to questions posed to a person who has been dead for years.

And no, this is not science fiction. For the hams who are here three generations from now, talking with silent keys will probably be a fact of life.

Thanks to Q-News, via Newsline, Bill Pasternak WA6ITF, editor.



Last year, James Alderman KF5WT set up a portable station at a Dallas trailer park for Kids Day on the Ham Bands, and invited kids to experience the thrill of amateur radio. In addition to 8 contacts, the kids enjoyed making posters, coloring maps, and relaxing with cookies and punch. A good time was had by all.

Dave Ingram K4TWJ 4941 Scenic View Dr. Birmingham AL 35210

New Millennium Wish List

A budget-conscious guide to exploring new amateur radio horizons.

What special treats and easy-to-explore frontiers await today's progressive-minded amateurs? Our new senior editor, K4TWJ, gives us a peek preview of some unique and surprisingly affordable activities guaranteed to keep your radio life exciting. Look for fun coverage of them all in the new 73. — Wayne.

mateur radio today is a bunch of activities that can keep you inspired and enthusiastic for years. Many folks, however, limit their enjoyment to one or two always-popular areas, like DXing and contesting, rather than investigate other avenues of

Photo A. Operating AM with a restoredto-new vacuum tube rig from eras past offers more thrills and excitement than cruising Route 66 in a classic auto — and it is also noticeably less expensive! Here, we see well-known amateur radio photographer Joe Veras N4QB operating 10 AM with a classic Johnson Ranger transmitter and Collins 75A-4 receiver. Now that is a real glow-in-the-dark ham rig, gang!

special interests just for fun. Why? Most need basic "what is it and how do I get started?" details.

Bearing that in mind, I have compiled a list and a review of some hot activities you can tune in and monitor in your own shack. The list is not complete, but it is a good starting point from which we can expand in future issues.

If your favorite activity isn't listed, please pass along the details: frequency and time(s) of operation(s), and notes for inclusion in a future/updated listing. Amateur radio is fun, and we want to see everyone enjoying it to the max! My opening list of activities is shown in **Table 1**, and brief introductory explanations of each area follow here. Enjoy!

AM operations

Yes, AM is making an encore comeback on the bands — and it sounds absolutely marvelous. Do not just take my word for that statement: Listen between 29.0 and 29.1 MHz on weekends and judge for yourself. You will hear operators using Johnson Rangers and Valiants, B & W 5100s, Heath DX100s, Collins 75A4s, and National

NC-300s, plus broadcast-quality microphones and recording studio-type audio equalizers (**Photo A**). You'll enjoy the resultant "bright lights and glamour" sound, heartwarming memories of classic glow-in-the-dark tube rigs, and the surprisingly high signal strength of low power/barefoot stations. Then you'll start scouring hamfest flea markets for a classic setup to restore.

ORP activities

This is one of the hottest areas of special interest in amateur radio — and it continues growing at a phenomenal rate. New clubs, newsletters, kits, projects, and QRP contests are springing up almost monthly. While big-time equipment manufacturers reported declined sales a few months back, producers of QRP gear were backlogged. Honest!

Why such interest in QRP? It is low profile and low cost hamming at its best. You can carry a little two- or three-watt transceiver and battery pack in your pocket, set up with a wire antenna almost anywhere, and span the globe when conditions are good (Photo B).

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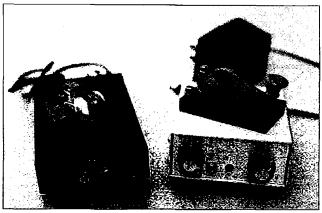


Photo B. Home-brew delights! QRP transceivers like these 3 watt 20 and 30 meter units make dandy weekend traveling companions. They can be powered from batteries or wall adapter-type power supplies, and they work out great from almost any location. Now that is what we call "HF to go!"

If you enjoy using new rigs but aren't on a big budget, you'll love QRP. More articles, projects, and reviews of QRP goodies are slated for future issues. Remember, too, that all the upcoming secret tips for QRP success are equally applicable to 100watt-type home and mobile setups. Read Mike Bryce WB8VGE's "ORP" column for more news and info on QRP.

County hunting and mobiling

You have probably heard about this colorful awards program, and may even be halfway to earning your own "Worked All Counties" award, but have you considered being the hunted rather than the hunter? It's a blast you help others increase their totals, while at the same time you can try out contest- or DX-style operating. Try out this terrific way to enjoy mobiling!

Slow scan TV

This mode has captured hams' attention for several decades. SSTV is the only video medium that supports realtime worldwide exchanges of pictures without requiring a broadband satellite for relaying signals. Each day's operations on SSTV are both exciting and unpredictable. You may see views of another operator's setup, a sunset across Sydney Harbor, or a fresh snowfall in Japan. Technical-minded SSTVers experiment with and build their own equipment. Others use Kenwood's battery-powered VC-1H SSTV unit to have a ball working both HF and VHF. Why not check out SSTV? You'll like what you see!

PSK-31

This is one of the latest forms of printed communications. It is similar in concept to RTTY or AMTOR, and joining PSK

is a breeze. You just add a couple of audio cables between your transceiver and home computer's sound card, include a simple line level (1 volt) to mike level (.06 volt) and speaker level (.5 volt) interface, and load PSK-31 shareware into your computer. Tweak levels, fire up your gear, and you are ready for action.

Exactly how popular is PSK-31? Listen in the "data range" of 20 meters (14.065 to 14.080 MHz) and judge for yourself. The familiar "twee-loos" of RTTY and the "chirping cricket" sounds of AMTOR will be heard around 14.065 to 14.080 MHz, and the warbling single/continuous tone of PSK-31 will be heard around 14.070 MHz. Being computer-based, this new mode holds high potential for future expansions — and right now is the ideal time to get in on the ground floor. Watch for more on PSK-31 coming in future issues of 73, and stay tuned to the digital world in general through Jack Heller KB7NO's "The Digital Port" column.

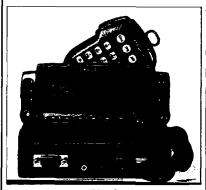
10 meter FM

Looking for new thrills? Just tune your FM rig to the international "direct" frequency of 29.600 MHz, and then continue as usual until DX stations begin opening its squelch. You'll be amazed at how many stations can reach out hundreds or thousands of miles with low power on 10 FM. European

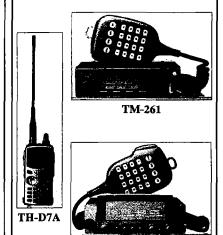


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ACTIVITY/PURSUIT	FREQUENCY(I	ES)/RANGE(S)	TIME(S) OF OPERATION	SPECIAL NOTES	
AM operations with classic rigs		MHz informal net on PST Wednesdays	Any time 10 meters is open — especially on weekends	Incredibly great sounding stations. Watch for upcoming article on great sounding stations.	
	cw	SSB			
	1.810 MHz	1.910 MHz			
	3.560 MHz	3.985 MHz			
OPP operations and	7.040 MHz	7.285 MHz	Any time and all the time. Contests	QRP is a hot and growing interest	
contests		mong amateurs of all license classes. Also see "QRP" column by Mike Bryce			
		WB8VGE.			
	24.906 MHz	24.950 MHz			
	28.060 MHz	28.385 MHz			
	50.060 MHz	50.885 MHz			
	All frequencies ± 10 kl	Iz according to activity.			
County hunting and CHC mobiling	14.055 MHz	14.335 MHz	Any time and all the time. Greatest amount of activity on weekends — when folks are traveling.	Working toward a County Hunters award is super fun. Being a hunted county is even more exciting.	
	Frequencies approxim	approximate.	when tolks are traveling.	county is even more excuring.	
	3.845	5 MHz			
	7.220 MHz		Any time and all the time. International SSTV Net meets on	Musical sounding tones with "clicks" worldwide pictures!	
Slow scan TV	14.230 MHz				
	21.34	0 MHz	14.230 MHz Saturdays at 1800 worldwide GMT.	worldwide pictures:	
	28.68	0 MHz			
	50.20	0 MHz			
	Frequencies	approximate.			
PSK-31	14.070–14	4.075 MHz	Any time and all the time.	Today's easiest-to-join mode of printed communications.	
10 meter FM	29.480 MHz	–29.700 MHz	Any time 10 meters is open — especially on weekends.	Combines the quiet monitoring conceptor of FM with the range of 10m. Also see KE8YN/4's "On the Go" column.	
6 meter FM	52-54 MHz repeaters	52.525 MHz simplex	Any time 6 meters is open.	Also follow the "On the Go" column for more info.	
AO-27: The orbiting FM repeater/satellite	145.850 MHz uplink	435.800 MHz downlink	During daytime, 1 or 2 hours either side of noon, local time. Actual pass is 15 minutes.		
	(± Dopp	oler shift)	is 13 minutes.		
SO-35: The orbiting parrot repeater/satellite	436.300 MHz uplink	145.825 MHz downlink	Exact operating schedule to be announced.	Also see Andy MacAllister W5ACM's "Hamsats" column for latest news.	
	(± Dopp	oler shift)			
RS-13: The 15 to 10 meter relaying satellite	21.210 MHz-21.250 MHz uplink	29.410 MHz-29.450 MHz downlink	Schedule of times announced on AMSAT Net, 14.282 MHz, Sundays at 1900 GMT.		
ICOM Users Net	14.31	7 MHz	1900 GMT Sundays		
Collins Users Net	14.26	3 МНz	2100 GMT Sundays	Rig news, notes, and info galorel	
Swan Users Net	14.25	0 MHz	2200 GMT Sundays		

Table 1. Ham radio fun!

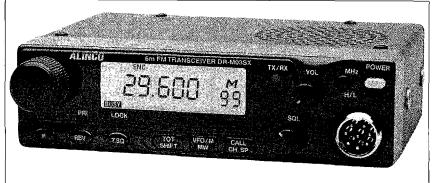


Photo C. Imagine working European stations via a New England-based repeater or reaching into the South Pacific through a West Coast repeater, and you have a good idea of the newfound fun awaiting you on 10 FM. Yes, and all you need is a low power transceiver and basic antenna to join the action. The fun starts on 29.600 MHz. Check it out!

and African FMers roll in during morning hours when ten is "hot." Australian, Hawaiian, and Japanese stations are solid many afternoons and evenings, while some stations throughout the U.S. and South America frequent 10 FM almost continuously (Photo C). Repeaters on 10 FM (some in the U.S., some in distant lands) typically operate on 29.620, 29.640, 29.660, and 29.680 MHz, with "100 kHz down" inputs on 29.520, 29.540, 29.560, and 29.580 MHz. A second simplex channel on 29.480 MHz is also becoming popular. For more details on 10 FM, see Steve Nowak KE8YN/4's "On the Go" column. We



Photo D. K4TWJ shows us how to pioneer new radio frontiers in (of all places!) a shopping mall parking lot. He is catching an AO-27 satellite pass "QRP style" using only a dual-band FM talkie.

will also be highlighting crossband linking on 10 FM during upcoming months! Stay tuned.

6 meter FM

The "Magic Band" is also seeing long-range FM action when the MUF goes up to 50 MHz or sporadic-E propagation flourishes — and that happens more and more often with today's increasing sunspot activity. Leaving your 6 meter FM rig squelched and tuned to 52.525 MHz puts you in the action. Be sure you know your grid square when working 6 FM, as everyone on six chases "rare" grid squares — it's sort of like DXCC hunting. Follow KE8YN/4's "On the Go" column for more details.

AO-27

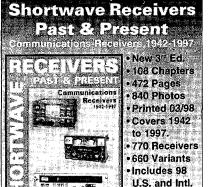
FM activities via OSCAR satellites are usually considered inappropriate, but AMSAT OSCAR 27 is different. This satellite is an FM repeater with an uplink frequency of 145.850 MHz and a downlink frequency on 436.800 MHz (both ± Doppler shifts). AO-27 can handle the full duty cycle demands of FM because its repeater is only switched on during daylight (when its solar panels are in the sunlight), and because it relays only one signal at a time (you make brief transmissions and share satellite time). Using a full duplex-type dual-band FM talkie with a tall whip antenna, you can typically

Continued on page 59





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Buffalo Springs Lake Half-Ironman Triathlon

Ham PR at its best.

It was 3:30 a.m., June 28, 1998, when my alarm jolted me from my short nap. I remember mumbling, "I'm too old for this," as I reached for the alarm clock. "Man, what a short night," I thought!

ust a few hours earlier, the Lubbock Amateur Contest Club (LACC) had been taking a break under the air conditioning inside the American Red Cross building to watch the 10 o'clock news. The LACC had invited the newspaper and the local TV. stations to come see what we were doing for Field Day.

Sure enough, there we were on TV. with the effects of the 105-degree temperature and 80% humidity etched on our faces! We were set up behind the Red Cross building with the tent, generators, radios, and all the other stuff you find at Field Day. Our main goal was to get the media to do some stories about amateur radio.

It seemed to have worked. Having a feeling of mission accomplished, we ended our one-day Field Day. Quickly tearing down the tent and packing up all the other stuff, we turned our attention to the next obstacle: The Buffalo Springs Lake Half-Ironman Triathlon.

Just two weeks earlier, the LACC had been contacted by Marti Greer, director of The Buffalo Springs Lake Half-Ironman Triathlon. She wanted the club to take over the communications for the race. Realizing that this was a good opportunity for our small club, we accepted.

The Buffalo Springs Lake Half-Ironman Triathlon (BSLT) is one of the three qualifiers in the U.S. for the Ironman Triathlon held each October in Kona, Hawaii. The event is held at Buffalo Springs Lake (BSL), 5 miles southeast of Lubbock, Texas. The BSLT consists of a 1.2-mile swim, a 56-mile bike race and a 13.1-mile run. In 1998, there were over 1,200 athletes entered in the Triathlon.

I remember thinking while Josh

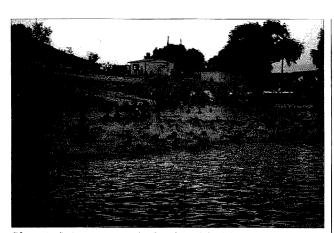


Photo A. Swimmers start the first leg of the BSLT.



Photo B. The transition area is always a busy place.



Photo C. Josh KC5VKA (left), Contest Director Marti Greer, and Sloan KC5YPY help a contestant in the transition area.

KC5VKA (who happens to be my 14-year-old grandson) and I were driving out to the lake, "How in the world we were going to do this big event with only ten people?"

About that time, the lights of the lake appeared over the edge of the canyon and the adrenaline started to
pump! We made our way to the BSL
fire station, where the other members
of the LACC were already setting up
the radio gear. We were to share the
room provided to us with the Texas
State Guard, who were providing traffic
control for the race.

After the radio and antenna were in place, we had a short meeting and

decided who would work where on the race course. Ron Daughtry KC5TWV would handle the net control duties for the event. Ron did a great job on a moment's notice! Rick Roy KB5KYJ would be the rover station — his duties would be to pick up and transport any of the tri-athletes who were in trouble. Little did Rick know how busy he would be. Sloan Butler KC5YPY was the man in the hot seat. He would be at the transition area to relay all the information back and forth to net control. In 1999, Sloan received help from Josh KC5VKA.

Each member of the team had several miles of the course to cover. This meant a lot of driving along the bike course. With over 1,200 riders on the course, you had to give it your full attention.

We were responsible for several things: Report the position of the first 30 riders, check the rest stops and make sure they had water and ice on hand (which proved to be quite a task), and check on the health and welfare of the athletes.

When you work an event this size you need reliable communications. We were fortunate to have the use of Lee Kitchens N5YBW's repeater, located in Lake Ransom Canyon just below BSL. This machine covered all of the canyon area with no problem. Thanks, Lee, for your help! Joey Johnston KC5MVZ set up his 444.275 machine on the rim of BSL for our backup repeater — luckily, it wasn't needed. To keep in touch with each team member directly, we used 434.050 simplex.

Once the race started, we were busy as beavers. Net control bombarded us with requests for infor- mation on the race leaders, then the status of the rest stops along each member's section. The rest stops quickly ran out of water and ice. This information had to be relayed back to the transition area, where Sloan KC5YPY notified the race officials. Just a note about Sloan: He must have run a short marathon himself — man, was he tired!

As the race progressed, the course started taking its toll on the bikers. A report came in from Jerry KC5MVT located at Spiral Staircase Road. He had a rider down with heat stroke and needed an ambulance. Jerry had extensive EMT training and knew what to do — which was good, as it took the EMTs 45 minutes to reach his location.

Then came more reports of riders in trouble. Rick KB5KYJ, our rover station, stayed busy all day picking up those whom the course had defeated. On one of these occasions, Rick came upon a runner who had gone down on his descent back into the lake area. This guy was in big trouble!

Rick remembers: "When I picked this guy up and put him in my truck, he was still trying to run — he didn't know where he was!" While Rick was wrestling with more victims of heat stroke, Harrell Ellis KD5ADO had taken up position behind the last runner in the triathlon. The runner, Chris, was a young handicapped man in a wheelchair, who had come all the way from England for the race. Harrell followed Chris in his van and provided



Photo D. Cyclists paid a price in Horseshoe Bend Canyon.



Photo E. At long last ...

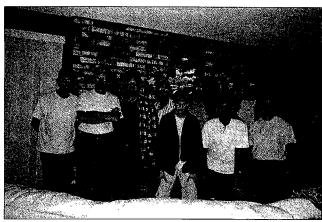


Photo F. BSLT hams. Back row: Joey Johnston KC5MVZ, David Herring KC5VKB, Jack Taylor KM5SI, Harrell Ellis KD5ADO, Sloan Butler KC5YPY, Koy Carson K5KOY. Front row: Josh Herring KC5VKA, Rick Roy KB5KYJ, Eric Howard KC5RWK, Not shown: Bill Vickers KJ5BX, David Knight KC5HNI, Jerry Russell KC5MVT, Ron Daughtry KC5TWV, Bob Metheny KD5GDD.

water and moral support for 32 miles. Unfortunately, with only one mile to go, Chris could not finish the race. This is real-life drama and ham radio was there.

Doing an event like The Buffalo Springs Lake Half-Ironman Triathlon is really fun, even though it lasted for 10 hours. It gives you a needed shot in the arm where amateur radio is concerned. It's good to help the community and let them know what hams can really do. In 1999, we used 14 hams at the event; in 2000, we will probably need 20. This thing just keeps getting bigger!

Oh, I almost forgot: Something funny happened out on the Farris Rd. section of the course. Koy K5KOY had gotten out of his truck and was intending to get some bottled water out of the back so that he could have some to drink. All of the sudden, a young lady who was in the triathlon stopped and asked if he needed something to drink! "Man, I must have looked pretty bad," Koy recalled, "for her to stop her race and offer ME water!" Even though the temperature was well over 100 degrees, I think she was just saying thanks to a hot and sweaty ham who was watching over them.

In case you think this is the only thing going on in the Lubbock ham community think again. Lubbock is abuzz with activity. It wasn't always

but way, things are really looking up for the new millennium.

We have a very good 2 meter net on Tuesday night at 8:00 CDT. Hosted by Randy Hobbs KC5HNH, this net covers a two hundred mile radius around Lubbock. In September the entire ham community came together at the Panhandle South Plains Fair for a weeklong exhibition of the capa-

bilities of ham radio. This proved to be very successful, as almost 80 people signed up for the upcoming ham radio classes.

Early this year, the LACC will start its code classes up again. And finally, we have a new RACES/ARES group in Lubbock. I would like to thank Clinton Thetford N5UOF and the rest of the RACES committee for their tireless efforts in bringing this to a reality.

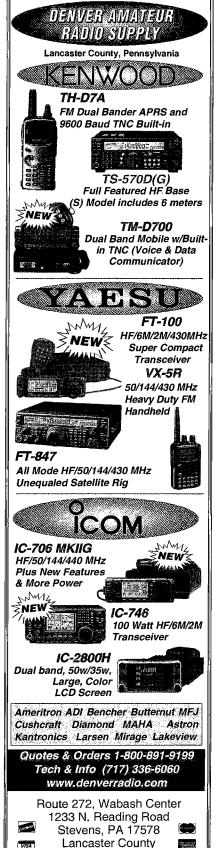


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Inside Alinco's DR-M03

This 10m transceiver is right for everybody.

Have you ever thought about running HF from your car or portable operations setup but decided that the equipment was too big and too expensive? Well, surprise! Things have changed in the last few years, and there are more options than ever. Ten meters is one of the most interesting bands to work, and a lot of the real action on 10m meter FM is through repeaters. A good 10m rig is built to optimize performance for both simplex and repeater operations. One of the latest is the new Alinco DR-M03 10m FM transceiver, which has just been released.

hen I first opened the box it was shipped in, I was surprised at how compact the unit was. The new arrival, complete with its microphone, DC power cable, mounting bracket, and instruction manual, is shown in **Photo A**. The rig is smaller than the 2m rig I have been using in my car for the past few years. This transceiver measures only 1 inch high by 5 inches wide by 4 inches deep. The lines are clean, with a logical panel layout and only 2 cables and a speaker jack for connections in the rear. This is not a radio to intimidate the average ham; it

is a radio that said one word to me—fun. Being the logical individual that I am, I set the radio down and read through the instruction manual. It was more like speed reading, or skimming. Well, I actually did flip the pages. In any case I soon had the radio hooked to the power supply and antenna in the shack. I was right: This radio was going to be a lot of fun.

The user friendliness of any technical item is very important to me. This is especially true for rigs that I use in the car, because hitting a wrong button can mean losing a frequency until I

pull into the driveway. This rig's front panel is laid out so that the controls are accessible.

On the left is the large tuning knob. On the right above the microphone plug is a push-on, pushoff power switch. In the center is a large, easy-to-read digital frequency display with the volume and squelch controls to the right. There are six other controls below the display, and one other button near the top, but their placement does not distract or cause inadvertent entries.

A tour of the front panel

The display (Photo B) is backlit and easy to read in daylight or darkness. It displays the current frequency to two decimal places and adds a small 25, 50, or 75 at the end to indicate a total of 4 decimal places. The rig covers from 28.0 to 29.7 MHz. There is a Busy indicator when a signal is being received that is strong enough to open the squelch, and a bar graph showing relative signal strength of a received signal or relative power during transmission. There are other displayed indications which I'll touch on later. And there is the standard LED that glows red when the rig is transmitting and green when a signal is received.

Typical of most modern radios, many of the controls serve multiple purposes. I was pleasantly surprised to find that the labeling is clear enough to understand without the necessity of constantly referring back to the manual. A few controls, such as the

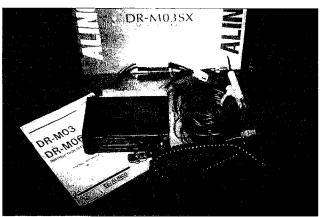


Photo A. Alinco's DR-M03 comes with microphone, manual, mounting bracket, and DC cables.

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Photo B. Front panel view of the DR-M03.

power switch, squelch, and volume controls, are single purpose, while most of the others are multifunctional. The main tuning knob can be used to select frequency, memory channel, transmit offset, and subaudible (CTCSS or PL) tones. At the top of the rig is a button that allows the frequency to be changed in 1 MHz steps to speed frequency adjustment. Its alternate function is to switch between the 10 watt high power or 1 watt low power.

Yes, but what can it do?

Now, I don't know about you, but as much as I like gadgets, gizmos, horns, bells, and whistles, I get a little overwhelmed when I see a lot of features on a new rig. I like to know what this means to me. In other words, why is a particular feature important and what is its function?

As I mentioned before, below the display are six buttons. The first is the all-important function key, which allows you to access the alternate uses of the other keys. Press the function key then another button to activate that button's secondary use. Interestingly, the function key itself has a second function. If it is held down for more than half a second, it opens the squelch to permit monitoring the frequency for weak signals. This is handy if you hear a station that breaks the squelch but does not hold it open - just hold the function key down for over half a second and the squelch stays open until vou release it.

The second button reverses the transmit and receive frequencies. This

of course allows you to see if you are able to hear another station on input frethe quency. In some cases, a signal may be more clear direct than through a repeater. It's fairly common for me to use a repeater in the Boston area to work a station in Europe or Texas from my car in

Florida. Sometimes the path from Texas might be more direct. In such cases, rather than tying up the repeater, you can switch to a simplex frequency and rag chew. This same button also activates the priority function, which allows a selected frequency to be periodically monitored. When this feature selected, the rig automatically switches to monitor a selected frequency for a half second every five seconds. You can listen to the main frequency but automatically check the second frequency to see if anything is happening there. Since I tend to do a lot of emergency and disaster service support, the idea of keeping an eve on an alternative frequency is very appealing. Of course, this same feature will let you copy traffic while waiting for a call on a totally different frequency.

The third button is primarily used to set the CTCSS tone. This is similar to what you find on the local 2 meter or 440 MHz repeater — a subaudible tone is transmitted with the carrier that is set to operate a particular repeater. When conditions are favorable (and with the rising sunspots plus alwaysavailable sporadic-E propagation), this becomes an important feature so that an operator doesn't bring up every repeater on a given frequency. Likewise, if a repeater is tone encoded, you need the ability to generate the specified tone in order to activate it. Many, but not most, 10m repeaters are tone encoded at this time, and as conditions continue to improve, more may be. This same button can be used to lock most of the functions on the rig. Once



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locked, only the push-to-talk, power level, and monitor selections (and the unlock function, of course) work.

Have trouble remembering to unkey the mike? The next button can be used to set a timeout timer for a period of up to 7 minutes. While most of us would never admit to having a heavy finger on the PTT button, we all occasionally get long-winded. However, there is a real potential benefit to this feature. I'm thinking seriously of playing with a crossband repeater that would have an input on VHF or UHF and its output on 10 meters. This TOT would provide protection for the system on top of the repeater controller. After all, a stuck carrier-operated relay has proven the demise of more than one transmitter! I think I would set the timeout timer for about 90 seconds and sleep better at night. This button in its secondary mode allows the repeater offset and direction to be selected. While current practice is that 10m meter FM repeaters have the input 100 kHz down from the output frequency, practices do change with time.

We have the ability to switch between the VFO and memory channels with the next button. This is fairly straightforward, with the VFO used to select a frequency that is then stored into a memory location, which logically it should be, and is the alternate function of this same button. Of course, you can store not only the frequency, but also the offset and any tone which might be required. More about memory operations in a bit. One thing to remember is that when using the priority function, if the VFO determines the primary frequency, the secondary will be a memorized frequency or vice versa.

The final button is used to activate a call frequency. This frequency, which is probably your favorite or most often used, is stored in a special memory location. By pressing the call button, you immediately access this frequency without the need to scroll through the memorized frequencies. This button also is used to set the incremental spacing for transmit and receive frequencies.

The unit has 100 memory channels. At first I thought this might be a bit of

overkill, since there are two recognized simplex frequencies (29.60 and 29.48 MHz) and four pairs of repeater frequencies (29.52/.62, 29.54/.64, 29.56/ .66 and 29.58/.68 MHz). Intuitively, it would seem that much fewer memory locations would be required. However, many repeaters have CTCSS encoding, so you need additional memory locations to store the tone information. Although there are nearly 50 repeaters listed in the current repeater directory as transmitting on 29.62 MHz and many are not encoded, you'll need different tones for Talladega, Alabama, than for Sioux City, Iowa, and Metairie, Louisiana. Don't laugh: One day you'll be working the world through Boston, Massachusetts, and the next it will be through a repeater in San Juan, Puerto Rico!

I haven't decided whether it is better to cluster the memorized selections by local (channels 1–10 are northeast, for example), or by frequency. If by frequency, when you hear a repeater that is sending a solid signal on a given frequency, it would be easier to scroll through the selections to choose the proper CTCSS tone.

Okay, but how does it work?

Just fine, thank you. I decided to try the rig out in the car, so I mounted it on top of the other two rigs that are already bolted to the floor. This unit comes with one of the most secure and easy-to-use mounts I've ever seen. It is supplied with enough cable to reach the battery in my car, and both legs have fuses at the battery end. The DC plug, incidentally, is interchangeable among Alinco's DR-M03, DR140, and DR605, "switch hitting" to mate with your interest of the day. Although there is a jack for an external speaker, and I tend to favor larger speakers, particularly in the car, I have to admit that I was quite satisfied with the audio quality using the built-in speaker. I've used a couple of different antennas, and as we all know, when it comes to the antenna, don't scrimp. Get a good antenna and make sure your modern state-of-the-art plastic and alloy automobile provides an adequate ground plane. A mobile whip works well for VHF and UHF since transmissions are line-of-sight ground wave; with 10m, you will often be dependent upon the sky wave, which is the signal that bounces between Earth and the ionosphere. Did I mention not to scrimp on the antenna? Good.

I initially loaded the memory with the four basic repeater pairs and the two simplex frequencies. Initially, I expected that the repeaters I would be using would be in the southeast United States. However, after listening for a while I began copying some of the repeaters' identification and realized that some of the machines I could hear and wanted to work were farther away than I had anticipated, not to mention tone encoded. I pulled out my trusty repeater directory, looked at the date on the cover, and headed to the radio store to get a current one. Then I sat down and began programming in additional repeaters. From my home QTH in Florida, and my travels on the east coast and across the peninsula, I have done my best with repeaters in New England, Canada, and Puerto Rico.

My routine when driving is to hit the power button as I start down the road. I leave the rig on memory (as opposed to VFO). The microphone has two buttons on the top that can be used to move up or down either through frequencies or through memory locations. Just hold one of these buttons for a second or so, and the rig begins to scan. When a signal is detected, the scanning stops on the busy frequency for about five seconds and then continues. If I hear a strong signal, I can stop the scan by tapping the up or down button on the mike. Obviously, if you press the push-to-talk button, scanning will also stop. Occasionally, I will switch to the VFO setting and then go into scan mode just to see what else is happening on 10m.

In mobile operations, once I have the memory locations loaded, the only front panel controls I tend to use are the power and volume controls. Since I can control scanning and transmit from the mike, that is all I need. Okay, I do peak at the display, but usually I am more interested in which memory location I am using rather than the actual frequency.

What's next?

This rig presents a number of interesting possibilities. I've been in the position where my work required a fair amount of travel, and there's nothing more boring than motel rooms night after night. Since this unit draws only 3 amps on transmit and 800 mA on receive, a small power supply will readily power it for portable operations. A ten meter dipole with ten feet of coax can be rolled up easily so that the rig, antenna, and power supply can fit into the corner of a suitcase. This would be a great rig to take along on vacation. If my bicycle hadn't been lost by the movers a few years ago, I would be tempted to attach this and a gel cell and operate two wheel mobile. I've been tempted to try to fit one into a fanny pack (or bum pack as my Kiwi friends prefer) and operate totally portable. What about adding a solar panel to charge the gel cell? Then, of course, there's that crossband repeater I mentioned earlier.

Low cost, big thrills

To me, the Alinco DR-M03 10m transceiver is the type of rig that makes ham radio fun. It's easy to use. It works well as a mobile rig, yet its small size presents a number of additional opportunities. It got me thinking about what else I could do with it and when to try other areas of the hobby that I hadn't played with before. Like I said - fun.

Thinking about new HF adventures? Check out this neat little 10 FM radio from Alinco.

For more information on the DR-M03 or its 6m sister, the DR-M06, contact Alinco USA, 438 Amapola Ave., Suite 130, Torrance CA 90501; telephone (310) 618-8616 — or testtune an Alinco at your favorite dealer today.

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Junk Box Audio Test Generator

This scavenged helper is easy to build and fun to use.

I designed this device to be a junk box home-brew project. Some of the parts were scavenged from old computer boards — only the chip was bought new. Among many other things, it could be used for modularly testing a transmitter or for troubleshooting commercial radio sets.

This is an AF function generator covering the frequency range between 25 and 25,000 Hz in three bands. It has sine, square, and triangular or sawtooth outputs; output sufficient to drive any amplifier: and distortion low enough to make it useful in high precision test measurements.

How it works

The frequency generator uses a dual op amp IC, the TL082 or an LF353, to produce the basic waveforms. The first of the two op amps in the IC is used as an oscillator, the frequency of which can be set by means of potentiometer P2: its range depends on the value of the capacitor C3 and is selected by means of switch S1. Trimpot P1 is used to adjust the duty cycle of the oscillator. The second op amp is an integrator that converts the triangular waveform produced by the oscillator to a square one, a 50% duty cycle. Potentiometer P4 is used to adjust the amplitude of the squarewave signal. Potentiometer P3 is used to adjust the amplitude of the triangular waveform. The signal from the output of the oscillator is taken to the circuit designed around the two transistors to be converted from a triangular wave to a sinusoidal wave. The two trimpots P5 and P6 are used to adjust the symmetry shape of the positive half and the negative half portions of the sine wave signal for the best symmetry and minimum distortion. P7 is the potentiometer that adjusts the output level for this waveform.

As you can see, the circuit consists of fairly basic building blocks with independent adjustments for every one of them, which makes this a very versatile and easy-to-operate instrument. The power supply is also incorporated on the circuit board in two ways. If you want to use a 12 VAC @ 0.05 A or more, use diodes D4, D5 and capacitors C13, C14 as shown. If you want to use a 24 VAC @ 0.05 A or more transformer, use all four diodes D4, D5, D6, and D7 as shown and omit C13, C14.

Construction

I assembled my prototype on a PC board, but a perfboard can also be used.

First of all, let us consider a few basics in building electronic circuits on a printed circuit board. The board is made of a thin insulating material clad

with a thin layer of conductive copper that is shaped in such a way as to form the necessary conductors between the various components of the circuit. The use of a properly designed printed circuit board is very desirable, as it speeds up construction considerably and reduces the possibility of making errors.

Soldering the components to the board is the only way to build your circuit, and your success or failure depends on the way you do the job. This work is not very difficult, and if you stick to a few basic rules, you should have no problems. The soldering iron that you use must be light, and its power should not exceed the 25-30 watt range. The tip should be fine, and must be kept clean at all times. For this purpose, you can use some very handy specially made sponges that are kept wet, and from time to time you can wipe the hot tip on them to remove all the residues that tend to accumulate. DO NOT file or sandpaper a dirty or wornout tip. If the tip cannot be cleaned, replace it. There are many different types of solder on the market. and you should choose a good quality one that contains the necessary llux in

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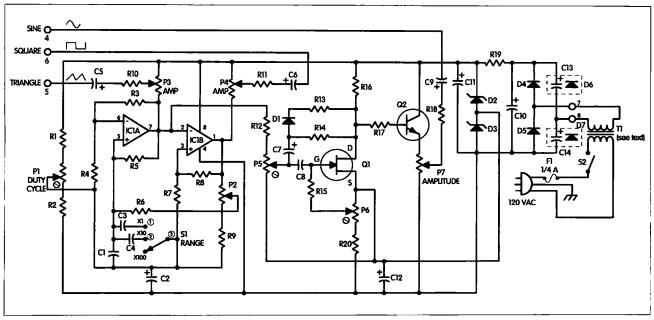


Fig. 1. Schematic. P2 is frequency control. Not shown are C15 (0.1 μ F, 200 V) and a bidirectional red-red LED that can be mounted off the board in series across (ahead of) the primary windings of T1.

its core, to ensure a perfect joint every time. DO NOT use soldering flux apart from that which is already included in your solder. Too much flux can cause many problems, and is one of the main causes of circuit malfunctions. Nevertheless, if you have to use extra flux, as is the case when you have to tin copper wires, clean the area very thoroughly after you finish your work.

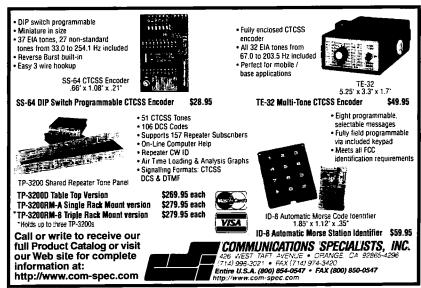
In order to solder a component correctly, you should do the following:

- Clean the component leads with a small piece of emery paper.
- Bend them at the correct distance from the component's body, and insert the component in its place on the board.
- You may sometimes find a component with heavier gauge leads than usual, that are too thick to enter in the holes of the PC board. In this case, use a mini-drill to enlarge the holes slightly. Do not make the holes too large, as this is going to make soldering difficult afterwards.
- Take the hot iron and place its tip on the component lead while holding the end of the solder wire at the point where the lead emerges from the board. The iron tip must touch the lead slightly above the PC board.
- When the solder starts to melt and flow, wait till it evenly covers the area

around the hole and the flux boils and gets out from underneath the solder. The whole operation should not take more than 5 seconds. Remove the iron and let the solder cool naturally, without blowing on it or moving the component. If everything was done properly, the surface of the joint will have a bright metallic finish to it, and its edges should be smoothly ended on the component lead and the board track. If the solder looks dull or

cracked, or has the shape of a blob, then you have made a dry joint and should remove the solder (with a solder pump, or a solder wick) and redo it again.

- Take care not to overheat the tracks, as it is very easy to lift them from the PC board and break them.
- When soldering a sensitive component, it is good practice to hold the lead from the component side of the board with a pair of long-nose pliers,



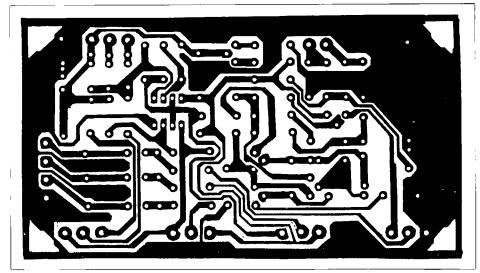


Fig. 2. Circuit board foil pattern.

to divert any heat that could possibly damage the component.

- · Make sure that you do not use more solder than is necessary, as you are running the risk of short-circuiting adjacent tracks on the board, especially if they are very close together.
- After you finish with your work, cut off the excess of the component leads on the foil side and clean the board thoroughly with a suitable solvent to remove all of the excess flux residues that still remain on it.

The function generator is relatively easy to build, and if you follow the instructions carefully, you should have no difficulties. Once you have the board and all of the components, you can begin by following the parts placement diagram. Mount all the resistors, then all the capacitors, then the diodes and semiconductors. Connect shielded cable from the board to the potentiometers, as well as to the output terminals and the range switch (S1). Then the rest of the wiring can be done.

Pay close attention to the orientation of the polarized components such as diodes, transistors, electrolytic capacitors, zeners, and so forth, in addition to the orientation of the DC source, which, if incorrect, can damage the IC and transistors.

Be sure to double check your work when you are done. Once you have your own function generator built, you must decide on a power source. I powered mine from a AC adaptor I had available. If you don't have one of these in your junk box, purchase a small 24 volt unit. The circuit draws very little current, so any

adaptor rated at a suitable current will do, and you're in business.

The only difficulty you may have is with the components that are not mounted on the printed circuit board. namely the potentiometers. switches, and the outputs. As mentioned, these should be connected with the rest of the circuit with shielded cables which should be kept as short as possible to avoid introducing noise and distortion to the output signal.

Again, start building the circuit from

the least sensitive components to make sure that you don't damage any components during soldering. The first components to be soldered should be the output pins and the IC socket. Identify the resistors and solder them one by one into their places. Do the same with the capacitors, taking care to insert the electrolytics the right way in. Solder the trimpots, the diodes, and the transistors, taking care to put them in the right way and not to overheat them.

Make a careful visual inspection of the board to ensure that you have not made any mistakes, then insert the IC carefully so as not to bend the leads as you put it in its socket. Connect the potentiometers, the range selector

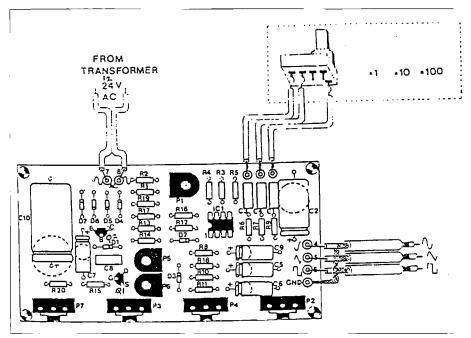


Fig. 3. Parts layout.

Technical	Specifications
	cy Response Hz in 3 ranges
Range A	25–250 Hz
Range B	250-2500 Hz
Range C	2500-25,000 Hz
Distortion	0.5% max.
Outp	ut Voltage
Sine & Triangular	4 V RMS (10 V PP)
Square wave	10 V RMS (16 V PP)
Output imped	lance @ 600 ohms

Table 1. Technical specifications.

switch, and the output pins as we described above, and the function generator is ready for testing.

Calibration

If you have an oscilloscope handy, connect the output of the generator to its input. Use a 12 V or a 24 V transformer to supply the generator with power, and adjust the trimpots to get the best possible waveshape on the screen. The potentiometer P1 should be adjusted first, till the square wave is perfectly adjusted for a 50-50% duty cycle. Then, by means of trimpots P5 and P6, you should adjust the waveshape of the sinusoidal waveform till it is symmetrical and as smoothly shaped as possible.

If you do not have an oscilloscope on hand and you only want to use the instrument as a general purpose audio generator, you will not be very wrong if you set the trimpots in their middle position. However, if you do so, distortion is likely to be higher and the instrument is no longer reliable for precision measurements.

If it doesn't work

- Check your work for possible dry joints, bridges across adjacent tracks, or soldering flux residues that usually cause problems.
- · Check again all the external connections to and from the circuit board to see if there is a mistake somewhere.
 - See that there are no components

Parts List		
All resistors are 1/4 W 5% unless otherwise noted, values in ohms		
R1, R2	4.7k	
R3, R4, R7, R6, R16, R20	10k	
R5, R6	33k	
R9	390	
R10, R11, R17, R18	1.8k	
R12	27k	
R13	330k	
R14	270k	
R15	1 meg	
R19	560	
P1	1k	
P2	5k	linear pot (front panel)
P3, P4	10k	log pot (front panel)
P5	25k	trimpot
P6	10k	trimpot
P7	5k	log pot (front panel)
		re 50 W VDC unless ted, values in μF
C1	0.001 (1000 pF)	polyester or mylar
C2	100	25 V electrolytic
C3, C8	0.1	polyester or mylar
C4	0.01	polyester or mylar
C5-C7, C9	10	25 V electrolytic
C10	220	35 V electrolytic
C11	100	35 V electrolytic
C12	50	16 V electrolytic
C13*, C14*	100	25 V electrolytic
D1		1N4148 or 1N914
D2, D3	10 V 0.5 W	zener 1N961B, 1N5240B, 1N4740A
D2, D3		
		1N4740A gen. purp. 1N4001, 1N914,
D4, D5		1N4740A gen. purp. 1N4001, 1N914, 1N4148, 1N34, 1N270
D4, D5		1N4740A gen. purp. 1N4001, 1N914, 1N4148, 1N34, 1N270 same as above

Miscellaneous: PCB or perfboard, pins, IC socket, case, line fuse, xfmr, solder.

*Note: Use C13, C14 with 12 VAC transformer. Use D6, D7 with 24 VAC transformer.

Table 2. Parts list.

missing or inserted in the wrong places.

- Make sure that all the polarized components such as diodes, electrolytics, or transistors have been soldered in the right way.
- Make sure that the supply has the correct voltage.
- Check your project for faulty or damaged components.

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Read All About It!

Part 2 of good stuff from The Hertzian Herald.

So what do you send after WX HR IS ...? Well, there are my ten favorite tech tips ... and the story of Rip Van Ham ... and ten (hopefully, non-) shocking safety pointers for handling electricity ... and ...

ast night I talked for an hour and twenty minutes to Bernie on 40-meter CW. Bernie had been an engineer on the EDVAC, which he staunchly maintained was the first "real" electronic computer. (ENIAC, which was in the next room at the U. of Pennsylvania, was really just an overgrown calculator, he said.) He gave me all sorts of details about the tubes and memory elements used in the earliest computers.

I have had equally enjoyable CW ragchews with:

- Paul, in Ireland, who gave me travel tips and sent pictures of his family, and of spots to visit if we come over.
- Larry, a state legislator in Texas, who was CW mobile.
- Prose, whose first rig was a spark transmitter in 1923, and who told me what a thrill it had been to work "DX" of 25 miles.
- Ed and Larry, who were landline CW ops, and attempted to teach me American Morse over the air.

Reprinted with permission from *The Hertzian Herald*, newsletter of the Monroe County (MI) Radio Communications Association (MCRCA).

- Rod and Betty, who were in their honeymoon cottage in Canada. (When I apologized for intruding, the new XYL came back with, NO PROB—CABIN FULL OF KIDS ES GRANDKIDS, SO ONE MORE WELCOME.
- Ty, for whom I was his very first CW OSO.

And yet I keep running into ops who sent RST, NAME, and QTH on the first round, WX and RIG on the second, and QRU ES 73 on the third. To me, radio is *communication*, and you're not really communicating with the ham on the other side until you get beyond these preliminary and really rather repetitive exchanges.

So what do you send after WX HR IS ...? Some of us get so wrapped up in the formality of those first two exchanges that we forget how to loosen up for the fun that comes after them. Here are some icebreakers:

1. AGE HR IS 53 ES BEEN HAM SINCE 1958. If your ages are similar, on the next go-around you can talk about common interests: school, kids, house-fixing, grandkids, retirement. If you both got into radio around the same time, you can compare notes on

- your first rigs. (If you get hold of an old-timer, don't fail to ask about those 1930s ham stations, or the WWII experiences there are some great stories out there.)
- 2. I TEACH ELECTRONICS AT A JR COLLEGE (or whatever you do for a living). RUFF DAY, KID DROPPED SCOPE ON FLOOR (or whatever disaster happened to you). Folks all love to complain about their jobs.
- 3. OTHER HOBBY HR IS BARBERSHOP HARMONY. I SING BASS IN A MENS CHORUS (or boating, or golf, or whatever). Most hams have other hobbies, and they love to tell you about them.
- 4. TOOK GRANDKIDS TO ZOO TODAY (or whatever you did today, or last week). The other ham will surely respond with a kid or grandkid or pet story. One guy in West Texas seemed to take comfort from telling me the whole story of how his cat had been bitten by a rattlesnake that day, and what a good cat it had been.
- 5. HR WRK MOSTLY 40 CW, BUT WILL TRY 160 CW THIS WINTER (or whatever your favorite modes and bands are). I got a real education in amateur satellite communications with this line once.

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6. USING VIBROPLEX BUG HR — NW HR IS WW2 J38 STRAIT KEY. CW ops love their keys more than their rigs. I've gotten rhapsodies about WWI keys and home-brew bugs with this leader.

Contesters and SSB ops may want beams and kilowatts, but you can CW ragchew on 100 watts and a dipole. A successful technique is to find someone with a good fist and a 599 signal at your speed and monitor the QSO for a few minutes. If it's nearing its end, call one of the stations when they sign. This is more likely to get you a copyable signal that won't fade on you than just calling CQ. Listen on the FISTS CW club frequencies — 7.058 and 14.058.

So give it a try — send something besides QRU after you send WX HR IS ... I guarantee you'll find that there are almost no boring hams. Every one of them has an interesting story, for those who have the skill to draw it out and the patience to listen.

Ten tech (no, not Ten-Tec) tips

Here are my favorite ten tech tips. If you have a favorite, perhaps you could send it along, and we'll do another column of reader tech tips.

- 1. If you store a car battery over the winter, don't store it on the floor of your garage. The air temperature changes by 20 or 30 degrees from night to day, while the floor temperature holds constant. Temperature differences between the top and bottom of the battery cause differences in generated EMF that produce internal currents, which discharge the battery. Place the battery on a styrofoam sheet for thermal insulation from the floor.
- 2. If you have to wind an RF coil, don't use PVC-insulated hookup wire. PVC has severe dielectric losses at certain frequencies which depend on temperature. I once fought an 80-meter home-brew rig for two weeks before I replaced the PVC wire in the tank coil with enameled magnet wire.
- 3. Cheap panel meters with no zero adjust can often be re-zeroed by holding a soldering gun close and turning it on and off. Several tries may be necessary to get the residual magnetism right.

- 4. Plastic-face meters may accumulate a static charge, making the pointer stick. Simply breathe moisture on the face to drain the charge.
- 5. When measuring resistances below 10 ohms, be sure to short the leads first. If the meter cannot be made to read zero, subtract this lead resistance from your reading.
- 6. Pencil lead is conductive. Never mark a circuit board with a pencil.
- 7. Torn loudspeaker cones can be repaired with tissue paper soaked in nail polish.
- 8. Most DVMs lose accuracy above a few kilohertz and are completely useless above 10 kHz. Analog VOMs are generally reasonably accurate into the megahertz range.
- 9. The tip bolts on a soldering iron loosen with time. If the gun won't heat, tighten the bolts.
- 10. Operator error is far and away the most common cause of service calls. If you are called upon to service an instrument, don't operate it yourself; have the person who called operate it so you can spot improper operation.

Rip Van Ham sleeps 27 years

Rip Van Ham was a jolly sort, captivated in his youth by the magic of radio and spending long hours as a teen sending CW, ragchewing with hamclub buddies, and home-brewing the "ultimate" 807 rig. But in his 25th year his key fell silent and a great sleep overcame him, from which he did not

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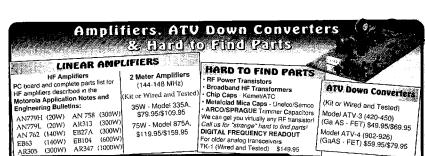
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awaken until the summer of 1996, twenty-seven years later.

And what an awakening it was! All of his buddies on 160-meter AM mobile were gone, and in their place was a crowd of 2-meter FMers using things called "repeaters" that made strange beep-boop noises, talked in robotlike voices, and covered impossible distances.

And their radios were incredibly small; and they had buttons instead of knobs on them. Yes, the new hams said they used "radios." In 1969, only CBers and BCLs had "radios." Hams had transmitters and receivers - a few rich ones had transceivers - but they'd be embarrassed to say they had a "radio," and the new hams talked politics and religion on the air - a thing unheard of in 1969.

So Rip got himself a radio — a used one — but from a Japanese company. The old companies were all gone: Hallicrafters, National, Hammarlund, Gonset, WRL-Globe, E.F. Johnson, Allied-Knight, "King" Collins, even Heathkit - all gone. But the new radio was incredibly inexpensive, even to someone used to 1969 prices, and it was far more stable than anything he had ever used. And, wonder of wonders! It displayed the frequency in glowing digits, down to tenths of a Kc — oops — make that | kHz.

He tuned to the 40-meter CW band and heard guys sending "ORL?" He had to look it up in the back of his yellowed old log book. Oh! A great idea. but useless in 1969; the answer then was always "QRL!" "Yes, the frequency is busy, they're ALL busy. Sandwich yourself in if you can."

Then, when Rip looked for the 40meter Novice band he found it moved 50 kHz. And there he heard a great silence, and he wondered what had happened to the thousands of lads with DX-20s and Globe Chiefs and homebrew 807s who used to make that part of the spectrum a mad cacophonous party every night of the week. The guys he heard giving their ages were all in their 50s, 60s, 70s, even 80s. Where were all the kids?

He sent a tentative CQ. Yes, that was still recognized. And the RST-QTH- NAME routine was unchanged. But these hams gave honest signal reports. He got a 229 from a DX station! Rip was used to 599 = Great, 589 = OK, 579 = weak, and Anything Else = Insult. And they sent N when they meant 9. And in a ragchew someone used SK to mean deceased. Rip wondered if that came from Silent Key, or ...meaning End Of Work. And another new term: Elmer. Never heard that before: wonder when it came in.

Oh, but many things were still the same. Wayne Green was still writing his blazing editorials, just like he was in 1969. And Lou McCoy was still writing antenna-tuner articles. And hams still sent "73," and meant much more than "best regards" by it.

And they still hurled their waves at the sky and marveled at how they bounced back to random corners of the globe as they wondered who would reply to their calls. And radio was still magic.

This will kill you

Hello, OMs and YLs. We had a major flood at the home QTH last month. engendered by a ruptured washing machine hose coupling. (I wish somebody had warned me to replace those things regularly — \$10 could have saved me many hundreds.) Thinking about water disasters got me thinking about electrical disasters, and how to avoid them. Here is a grab bag of safety tips.

- Electric shock usually kills by paralyzing the breathing muscles. It follows that most shock victims can be saved by simple mouth-to-mouth artificial respiration.
- Most booklets on resuscitation talk vaguely about clearing the airway of "foreign material." Let's speak plainly. A common reaction to shock is vomiting. You have to clear this stuff from the mouth so it isn't forced into the lungs.
- A minority of shock cases may cause malfunction of the heart or other organs, but you really need professional training to deal with that. Anyone can do the "pinch the nose and blow air into the mouth" trick.
 - If a 3-wire appliance such as a skill

saw or a microwave oven blows the breaker when you plug it in, it may have a short from the hot wire to the metal case. Don't think you're clever if you can get it working by using a two-wire extension cord or 2-wire adapter plug — the case is still hot! Touch that case and a ground point (wet floor, faucet, stovetop, etc.) and you're fried.

- When re-terminating 3-wire cords, it is a good idea to leave the safety ground (green) wire a little longer than the others so that it will be the last to sever in case the cord is strained.
- Automobile battery explosions are much more common than most people realize. (In a class of 20, I typically find about two students who have been involved with one.) Never charge a battery in an enclosed area. Charging produces hydrogen gas - very explosive. Open the doors and windows or do it outside.
- When jump-starting a car. make the last connection to the negative of the car with the good battery, but not at the battery terminal. Connect it to the car chassis at a place away from the battery so when the spark jumps it won't be near any explosive gas.
- When working on cars, take rings and watches off. One of my students once showed me the melted remains of his girlfriend's class ring, and a row of blisters down his arm. The ring had bridged the 12-volt line to the car chassis when he had thrust his hand under the starter to probe for a dropped nut. He was lucky it was a girl's thin band on his outside little finger, because it melted and fell off. If it had been a man's wedding band on the ring finger it would have resulted in an amputation.
- Electric shock is NEVER a joke. What may seem a harmless tickle to you could be fatal to someone with a heart condition or a pacemaker, and jokesters never have absolute control over who their victims might be. Even young people may have medical conditions unknown to themselves that could make a normally harmless shock fatal. If there is even a 1-in-10,000 chance that someone could be harmed. the joke is no longer funny.

73's DX Dynasty Award

This is the current list of DXDA award winners. The DX Dynasty Award is the most enjoyable DX award around. Any correspondence concerning DXDA should be addressed to DXDA. c/o 73 Magazine. 70 Hancock Rd., Peterborough NH 03458 USA.

BASIC AWARD—	55. VE3EFX	112, VE4SI	170. AA6GM	228. IK7DBB	286. WA4NWT
100 COUNTRIES	56. W9MCJ	113. PJ2KI	171. JAØSU	229. JY5EC	287. KJ4OI
WORKED	57. N6IV	114. WB4CKY	172. NU8Z	230. NIETT	288. KA3UNQ
	58. KN8D	115. W6EQB	173. GØGRK	231. PY2DBU	289. WB2VMV
I. WIRFW	59. KC5YQ	116. KK4IY	174. YB8VM	232. I8IYW	290. KD4MM
2. WB2DIN	60. WB6ITM	117. IK1IYU	175. DVIBRM	233. NØISL	291. OE3DHS
3. KT1A	61. KA2AOT	118. N6GCN	176. WØTU	234. KC4BEB	292. KD9HT
4. W3FDU	62. K4LHH	119. KBIAF	177. N7CNH	235. WA7QQI	293. DL8OBC
5. KA9JOL	63. VE2QO	120. KB8BHE	178. PY3IO	236. KAIRJG	294. G3KVA
6. WBIBVQ	64. KE5AT	121. KE2CG	179. YBØZCA	237. OZ9BX	295. WA4NEL
7. NW7O	65. W9SU	122. VS6CT	180. YBØAF	238. KB4HBH	296. KA4VZO
8. AK4H	66. W3OOU	123. G3IZQ/W	181. VE3PQB	239. KA3RWP	297. NØIDT
9. W3HCW	67. NR2E	124. WB6FNI	182. W2SV	240. NJ1T	298. KAIFUE
10. KZ2W	68. KF5PE	125. KAØIAR	183. NIADE	241. W4DCG	299. KD7EO
11. K9FD	69. N3FBN	126. K9SM	184. WP4AFA	242. YCØRX	300. JH8MWW
12. WD5N	70. KB4SJD	127. W6BCQ	185. KS7V	243. VE7OJ	301. KB8ICD
13. KA9TNZ	71. N3EZX	128. KA5MSL	186. W2OFB	244. AA4W	302. JA1CKE
14. K9GBN	72. IK8GCS	129. WB4FLB	187. G4ASL	245. N9GMM	303. N3GEE
15. N5GAP	73. WB4I	130. N7GLT	188. N5JUW	246. KB4HBH	304. JA5MG
16. WB3FMA	74. NG1S	131. WAØX	189. KA8WAS	247. KM4HF	305. KAIFTU
17. NN6E	75. WB7UUE	132. KF4GW	190. 5NØWRE	248. CE1YI	306. WA8KMK
18. AL7HG	76. HK4EB	133. N4QGH	191. AA4IP	249. KA1FVY	307. N2IBW
19. N6CGB	77. KØBFR	134. VE1CBK	192. JR5KDR	250. N2GVB	308. N4THE
20. K16AN	78. N7GMT	135. 7J1AAL	193. KD2WQ	251. N2DAO	309. N3CYD
21. K9JPI	(KF7SH)	136. K6ICS	194. KA3N1L	252. WF8E	310. JA4TF
22. N4WF	79. AA4VN	137. NZ7W	195. WA8YWK	253. YBØHZL	311. W6YLL
23. K6PKO	80. KA1LMR	138. WBØN	196. VE1ACK	254. N5MBD	312. WA1S
24. KW7J	81. N8AXA	139. WC7F	197. HP2XVB	255. N4SNS	313. KC5WA
25. VE6JO	82. NM21	140. F6IFE	198. WB5KYK	256. KA3TGY	314. N6WK
26. WA4IUV	83. KD9YB	141. KL7N	199. N5JUJ	257. JN3XLY	315. PY4OY
27. W4ZFE	84. HC2CG	142. KE8LM	200. N4OBJ	258. N4DUV	316. KG7BO
28, N4KMY	85. VEIBXI	143. WA6YOO	201. 9Q5NW	259. KA9MRU	317. WB3FQY
29. WØHBH	86. YC2OK	144. VE2MFD	202. KW2D	260. KA4OTB	318. WCØA
30. K8KJN	87. N4GNL	145. N3APQ	203. VE1HA	261. N4JED	319. VE4AMU
31. KG1V	88. GM3UBF	146. HK1DBO	204. HP8BSZ	262. AB4KA	320. YCØMCA
32. K1KOB	89, 5Z4BP	147. NM3V	205. IK8JJQ	263. WA7OET	321. WA3LEU
33. KY3F	90. IØAOF	148. IK6GFY	206. YC3DKN	264. KA3RVH	322. KB2GLO
34. PY2JY	91. VEIBN	149. WB6UAN/M	207. 13VKW	265. CE7ZK	323. OZ1FNX
35. YB5BEE	92. KA2NRR	150. NK6Z	208. K2EWA	266. N19J	324. K6GCF
36. YB5BEH	93. 5Z4DU	151. KB6IUA	209. KD3CR	267. WB9PTN	325. KC4PCX
37. WB9SBO	94. KB8ZM	152. W9OKH	210. N9GDG	268. KB8DAE	326. KA7EXD
38. NØAFW	95. HK4CCW	153. WB5FXT	211. KF8K	269. WØCL	327. DK9EA
39. KA9MOM	96. W2JQ	154. NB3E	212. FD1BEG	270. WB7VUB	328. HL5AP
40. N3II	97. HC2AGT	155. N2ESP	213. DUIDZA	271. JF6TUU	329. SM7BRO
41. W6DPD	98. WD5N/M	156. YU2EJU	214. N8IMZ	272. ZY3IO	330. ON6DP
42. KE8GG	99. VE1BHR	157. OZIDXX	215. KK4YA	273. KB4VIR	331. WA3KKO 332. KB9ABI
43. VE6VK	100. VEIAGZ	158. IK5IIU	216. LUIJDL	274. OE6CLD	I
44. KD9RD	101. K5AOB	159. KAHON	217. KA8YYZ	275. N7JJQ/DU3	333. DA2UI
45. W4WJJ	102. KW2D	160. KD3AI	218. KA4TMJ	276. KK4FB	334. SMØBNK
46. KØHSC	103. PY3ARZ	161. OKTAEH	219. WA9DDC	277. DUIAUJ	335. WA2BMQ 336. WAØQIT
47. KI6GI	104. WB4ETD	162. W9LCR	220. YIICIS	278. K2EWB 279. NI5D	337. 5Z4BH
48, IKTAPP	105. N2FPB	163. 8P6SH 164. KA6SPQ	221. YC3FNL	279. NISD 280. N2JXC	338. KB9ALG
49. KJ4RR	106. KD3CQ	•	222. GØFWG	l .	339. OA4ANR
50. K8MDU	107. K4NNK	165. ZF2KH	223. KV4B	281. NØIWT 282. WB3BDH	340. OD5ZZ
51. NIEIU 52. KIDPN	108. VU2DNR 109. AA5BE	166. W6MVV	224. N5IET 225. WA9WIG	283. KICVF	341. VE3ZD
52. KIDRN 53. WDSPEC		167. JA8CAQ 168. KI6WF	225. WASWIG 226. N3CDA	284. KA3CXG	341. VE32D 342. LU2ATR
53. WD8REC 54. ZL2BLC	110. PY3OG 111. VE4ACF	169. K2MRB	220. N3CDA 227. KE6KT	285. KAISPO	343. HL5FRG
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244 TIDELDE
344. UB5LRS 345. N1ICC
346. UY5XE
347. PS7AB
348. IK4NPC
349. KD1CT 350. DU1CHD
351. UB4WZA
352. LU3CF
353. G7AZP
354. VE5AAD
355. IK3ITX
356, SM4SEF
357. N9CPK
358. VE2JWK
359. N7JXS
360, KO4VO
361. JE1GWO
362. JM2DRM
363. IK1SLE
364. JF7QUE
365. HL5BUV
366. VE3GLX
367. N7QXQ
368. JE6KLR
369. KK6JY
370. N2BI
371. KK4XL
372. JA3SSB
373. KBØADI
374. 11-50156
375. VU2SMN
376. EA6AAK
377. N3IHS
378. N8MOT
379. KB2NEK
380. PY2DBU
381. WA2CKP
382. WB2PPN
383. JA1-2Ø762/BV
384. AB4ZD
385. YC8EMH
386. WA8RLB
387. N5VWM
388. VE7SKB
389. KB4BCC
390. VE7GSE
391. YC8BWN
392. KN6ER
393. KD1CJ

394. G2BFO

395. KB7ROK
396. VK2EQ
397. 4X4-2175
398. JE1BGL
399. KF2LC
400. WV2X
401. LU5EWO
402. WAØCLR
403. VO1UL
404. VE6AML
405. WD4REX
406. WAØCLR
407. VE3VJC
408. WA1MKS
409. JH6FHJ
410. JE9EMA
411. WK8X
412. TI2YLL
413. KP4WN
414. KD6MOS
415. KI7CM
416. JH1IED
417. JN6MIC
418. BU7FC 419. DL1EMO
419. DL1EMO
420. KD4TWP
421. 5W1GC
422. JA7JI
423. W5RUK
424. LU3OJZ
425. WD4OHD
426. 7L1MFS
427. ON4BCM
428. WØUHL
429. N4WJV
429. N4WJV
430, LU5DSE
431. HS1NGR
432. DUISAN
433. 4X/G3WQU
434. K3BSA
435. CP8AK
436. K8IHQ
437. JA7NUZ
438. HL5FXP
439. N9PM
440. K9UQN
441. WA7SNY
442, HL5YAW
443. DS5WQT
444. JH7GZF
445. K6CIL

447. WA8NPX 150 COUNTRIES ENDORSEMENT 1. WB2DIN 2. N4WF 3. N6GCB 4. K9FD 5. NØAFW 6. N3II 7. WB1BVQ 8. KA2AOT 9. KI6G1 10. N7GMT 11. IK8GCS 12. IK1APP 13. VE6JO 14. VE4ACF 15. WB4I 16. IK1IYU 17. KE2CG 18. G3IZQ/W1 19. WB6FNI 20. K8MDU 21. VE6VK 22. KB6IUA 23. WB5FXT 24. YU2EJU 25. IK5IIU 26. KE8LM 27. KA1ION 28. KA6SPO 29. W6MVV 30. JA8CAQ 31. KI6WF 32. JAØSU 33. WD5N 34. W2SV 35. W6BCQ 36. F6IFE 37. VE2MFD 38. WP4AFA 39. 5NØWRE 40. KD2WO 41. VE1ACK 42. N5JUJ 43.905NW

446. JK10JE

	48. GØFWG
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	54. YBØHZL
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	57. CE7ZK
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	61. KD3CQ
	62. KA4OTB
	63. WB2VMV
	64. KD4MM
ĺ	65. KD9HT
	66. KA3NIL
	67. NØ1DT
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	73. K2EWA
	74. WA1S
	75. PY4OY
	76. WCØA
	77. OZ1FNX
	78. KA7EXD
	79. ON6DP
	80. VE1RJ
	90. N6WK
	91. WA3KKO
	92. KB9ABI
	93. SMØBNK
	94. WAØOIT
	95. 5Z4BH
	96. OA4ANR
	97. OD5ZZ
	98. VE3ZD
	99. HL5FRG
	100. UB5LRS
	100. OBJERS 101. PS7AB
	101. F3/AB
	102. KD1CT 103. DU1CHD
	103. DUICHD
	105. IK3ITX
	106. VE2JWK

46. KD3CR

47. N8IMZ

109. HL5BUV
110. VE3GLX
111. KK6JY
112. EA6AAK
113. N3IHS
114. WA2CKP
115. VE6AML
116. WAØCLR
117. WA1MKS
118. KD6MOS
119. KP4WN
120. LU5EWO
121. 5W1GC
122. JA7JI
123. W5RUK 124. LU3OJZ
125. ON4BCM
126. WØUHL
127. N4WJV
128. LU5DSE
129. VOIUL
130. DUISAN
131. 4X/G3WQI
132. K8IHQ
133. K9UQN
134. WA7SNY
135. HL5YAW
136. K6CIL
137. WA8NPX
200 COUNTRI
ENDORSEME
1. N3II
2. WB2DIN
3. K9FD
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107. N7JXS

108. JM2PRM

37. HL5FRG

40. LU5EWO

41.5W1GC 42. JA7JI

43. W5RUK

44. LU3OJZ

45. WØUHL

46. N4WJV

47. VOIUL

49. K8IHQ

50. K9UQN

1. WB2DIN

2. IK8GCS

4. K8MDU

5. KE2CG

6. CE1YI

7. CE7ZK

8. K2EWB

9. KD9HT

10. N7GMT

11. KD3CQ

13. WA1S

12. KB8DAE

3. WD5N

250 COUNTRIES

ENDORSEMENT

48. DUISAN

38. JAI-2Ø762/BV 39. VE6AML

NT 7. VE4ACF 8. KI6GI 9. N6GCB 10. K8MDU 11. YU2EJU 12. KE8LM 13. WD5N

14. F6IFE

15. 5NØWRE

16. KE2CG 17. I3VKW 18. CE1YI

19. W6BCO 20. CE7ZK 21. KB8DAE

22. K2EWB 23. KD3CO

24. KD4MM

25. KD9HT

26. KA4TMJ

27. N7GMT

28. JA4TF 29. K2EWA

30. WA1S

31. PY4OY

32. ON6DP

33. VE1RJ

36. 5Z4BH

34. WA3KKO

35. WAØQIT

ENDORSE
1. WB2DIN 2. IK8GCS 3. K2EWB 4. K8MDU 5. N7GMT
6. WA1S 7. PY4OY 8. KD3CQ 9. VE1RJ 10. UY5XE
11. 1K3ITX 12. VU2SM 13. JA7JI 14. W5RUI 15. LU5EW
350 COUN

TRIES ENDORSEMENT

2. PY4OY 3. UB4WZA 4. JA7JI

5. KD3CQ

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14. PY4OY 15. VE1RJ 16.5Z4BH 17. N2BI 18. I75OI56 19. VE6AML 20. KB8ZM 21. LU5EWO 22 IA7II 23. W5RUK 24. WØUHL 25. K9UON

300 COUNTRIES EMENT

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Secrets of Transmission Lines

Part 6: The Smith Chart.

In the last chapter, we looked at the behavior of transmission lines under steady-state conditions, and paid particular attention to the variation of impedance along the line for various termination conditions. In the experiment, we noted the repetition of the termination impedance every half-wave as well as the cycling of the impedance between Zo*VSWR and Zo/VSWR. In this chapter, we are going to look at what happens between the pure resistance points.

n the previous work, we showed the expressions for the voltage and current along the line. From these expressions previously given, you can obtain the expression:

Zx = Ex/ixegn (6-1)

This simply says that at a point x along the line, the impedance is given by the voltage at that point divided by the current at that point. Bear in mind that both voltage and current can have forward and reflected components and may have real and imaginary parts.

The previously stated expressions for Ex and ix can be substituted into this expression to develop the equation for Zx. The actual manipulation is too long-winded for this treatment; however, for those interested, my version of it may be found in Exploring Antennas and Transmission Lines by Personal Computer, published by Van Nostrand Reinhold, New York. This book is now out of print, but still is in the possession of a number of hams and libraries. Other more current texts also carry the discussion.

simplify the printing of the equations we define

$$\beta = 2*\pi/\lambda$$
(6-2)

where

 λ = wavelength in the medium

It is also common to refer to the position j along the line as " & " rather than "x" as we have been doing; however. for the purposes of the computer program to follow, we will retain the "x".

Using these conventions, we may write:

$$Z_{x} = \\ Z_{0}*\{\frac{[Z_{1}*\cos(\beta x)] + [j*Z_{0}*\sin(\beta x)]}{[Z_{0}*\cos(\beta x)] + [j*Z_{1}*\sin(\beta x)]}\}$$
(6-3)

where

Z, is the terminating impedance Z is as defined in (6-1) β is as defined in (6-2)

This is the complete expression for the impedance at any point "x" on the transmission line. Note that it has real As another shorthand notation to and imaginary (reactive; remember

chapter 2!) parts and that the terminating element Zi can have real and imaginary parts as well.

For a particularly interesting case. let us set Zi = 0 (that is, the end of the line is perfectly short-circuited). For the shorted line Zi = 0, the upper left and lower right terms are zero. Therefore

$$Z_{x} = Z_{0} * \{ \frac{[0 + [j * Z_{0} * \sin(\beta x)]}{[Z_{0} * \cos(\beta x)] + 0} \}$$

$$Z_x = j*Z_0*tan(\beta x)$$
(6-5)

Equation (6-5) follows from the fact that $\sin(a)/\cos(a) = \tan(a)$.

The tangent function is such that if (b*x) = 45 degrees, then Zx = j*Zo. In other words, a shorted section of line an eighth of a wave long behaves like an inductor with a reactance equal to Zo ohms. At the half-wave point, the value of the tangent goes to infinity and the line section or stub looks like an open circuit, as we noted with the experiment in the previous chapter. As a matter of fact, the tangent changes algebraic sign just beyond a half wave and the stub looks like a parallel

resonant circuit. These properties of the shorted stub are widely used in impedance matching.

The Smith Chart

Before the advent of the programmable calculator and the personal computer, the principal tool for solving transmission line problems was the Smith Chart, introduced by P.H. Smith of Bell Labs in 1939. This graphical solution was a boon to telephone and radio engineers.

For the power utility engineer, the transmission line equations had to be taken into account only when working with very long transmission lines of hundreds of miles or more. Also, there was usually only one frequency to be

considered. In these infrequent cases, the transmission line equations were not too onerous.

For the telephone or radio engineer, on the other hand, the matter was more pressing. The telephone man had to deal with a wide range of frequencies and lines of moderate length, and, for radio work, even cables a few feet in length could show considerable impedance transformation, as we saw in our experiment. Having to solve the transmission line equations for a large number of frequencies using only a pad, pencil, and slide rule was tedious and time-consuming. The simple graphical solutions made possible by the Smith Chart were a welcome relief. Even today, when computing facilities are common features of nearly any

IMPEDANCE COORDINATES-50-OHM CHARACTERISTIC IMPEDANCE

Fig. 1. The Smith Chart, impedance coordinates, 50-ohm characteristic impedance.

antenna or RF lab, the Smith Chart is still used as the common way of displaying impedance/frequency plots.

An example of the usefulness of the Smith Chart can be obtained by considering the following questions.

- 1. With a given impedance or admittance termination, at what point on the line will a lossless reactance cancel the reflected wave? What size reactance is required?
- 2. Having measured the impedancefrequency plot at one point on a transmission line, what does the plot look like at another point on the line?
- 3. What is a given impedance when transformed into an admittance?

With the Smith Chart, questions 1 and 3 can be answered with a draftsman's compass and a straightedge, and question 2 requires only a small amount of calculation.

The Smith Chart is presented in all its glory in Fig. 1. At first glance, it can be a bit terrifying; however, we will look at the makeup a step at a time, and it will be a bit more simple to understand.

To begin with, you will note that there is only one straight line on the chart, right up the center. All the rest are circles, and technically the center line is also a circle of infinite radius. Smack dab in the middle of the chart is the characteristic impedance of the chart. If we are working with 50-ohm coax, then the center of the chart is 50 ohms. (For other characteristic impedances, they also print normalized charts with the center labeled one. Then, you multiply all the readings on the chart by the characteristic impedance. For instance, with our 300-ohm twinlead, you would multiply all readings by 300.)

The center line represents the locus of all pure resistances. Anyplace else on the chart has a reactive element. The center or pivot point is very important for the chart. All constant VSWRs pivot about the center of the chart. For example, if we have a 2:1 VSWR on the line then we know that as we move along the line, the impedance will pass through 25 ohms and 100 ohms A circle centered on the 50-ohm point will describe all the

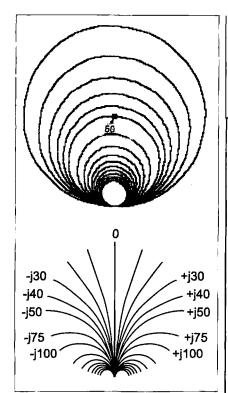


Fig. 2. The Smith Chart makeup. Top: Resistance curves are shown in 10-ohm steps for R<50 and 25-ohm steps for R>50. Bottom: Reactance curves.

impedances the line goes through. A quarter wave on the transmission line represents a half turn on the chart; the full circle represents a half wave, and the impedance repeats itself just as we saw in the last chapter.

Just think about this for the moment. By simply drawing the VSWR circle, we solved the transmission line equations for that load or termination for all possible line lengths.

Fig. 2 shows some of the resistance circles and some of the reactive circles on the chart. You will note that the zero reactance curve is the centerline and the reactance has a non-zero value everywhere else. The resistance circles and the reactance circles are said to be orthogonal, meaning that they always cross at right angles. Also note that all of the circles pass through the R/Zo = infinity point.

Fig. 3 shows how the circles are generated. Looking at Fig. 3(a), we can see that if we terminate the line in a short circuit at R/Zo = zero, then a quarter of a wavelength down the

line we will have R/Zo = infinity, and another quarter wave takes us back to the zero point. The R = 0 circle is the outer periphery of the chart. All possible impedances with real and reactive parts ranging from zero to

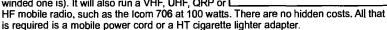
infinity can be plotted on the Smith chart.

Also given on **Fig. 3** are the formulas for generating a Smith Chart in admittance terms. It is often convenient to work in admittance terms, since it is





The POWER STATION is a 12v 7Amp/Hr gel-cell battery. It comes complete with a built in voltmeter, a wall charger and a cord for charging via automobiles. It powers most hand held radios at 5 watts for 2-4 weeks (depending upon how long winded one is). It will also run a VHF, UHF, QRP or



The POWER STATION provides 12V from a cigarette lighter outlet and has two recessed terminals for hardwining. A mini-phone jack with 3V, 6V, or 9V output can be used separately for CD player, Walkman, etc. The POWER STATION can be charged in an automobile in only 3 hours, or in the home in 8 hours. The charger will automatically shut off when the battery is completely charged. Therefore, The POWER STATION may be charged even when it has only been slightly discharged (unlike Ni-Cads that have memory). The charging circuit uses voltage sensing circuitry. Other brands are timed chargers, which always charge a battery a full cycle. If all that is needed is a partial charge, this damages a battery and shortens the life. The POWER STATION has a voltmeter that indicates the state of charge of the battery, not worthless idiot lights that declare "YOUR BATTERY IS NOW DEAD". The voltmeter can even be used to measure voltages of other sources.

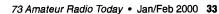
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usually easier to place corrective or impedance matching elements in shunt across a coaxial cable rather than in series. From a practical standpoint, you can cut the cable and install a "tee" and hang a shunt element there more easily than you can insert a series element. The

reciprocal of 50 ohms is 0.020 mhos or siemens.

An example of impedance matching with the Smith Chart

Next, let us consider an example of

i m p e d a n c e matching using the Smith Chart. We will work in admittance because I intend to do the matching with a short-circuited

stub of line of the same Yo (1/Zo) as the line. The example is shown in Fig. 4. We start with a chart having a 20 millimho center and plot the load on it, which is given as 10 + j2 mmhos. Next, we draw the VSWR circle. Only part of it is shown, for clarity. We rotate the arc until it meets the 20 mmho circle. The rotation is clockwise toward the generator and counterclockwise away from the generator. Next, we lay a straightedge from the center to the circular scale on the outside of the chart. The original load point reads .02 wavelengths and the point where



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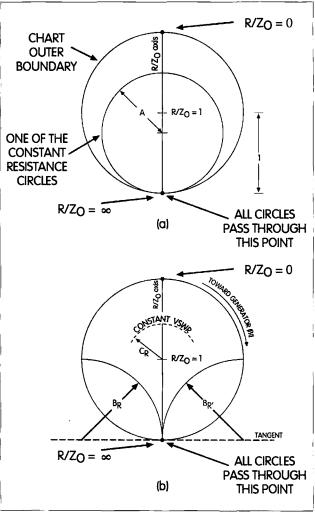


Fig. 3. Further makeup of the Smith Chart.

$$A = \frac{1}{1 + \frac{R}{Z_0}} \text{ or } A = \frac{1}{1 + \frac{G}{Y_0}} \qquad C_R = 2A - 1 = \frac{2}{1 + \frac{R}{Z_0}} - 1$$

$$B_R = \frac{Z_0}{X}$$
 or $B_R = \frac{Y_0}{B}$

the VSWR curve meets the 20 mmho circle is 0.154 wavelengths toward the generator. Therefore, the point to place the stub is 0.154 - .02 = 0.134 wavelengths toward the generator.

At this point, the admittance is 20 + i14.2 mmho, so we need to supply a shunt element of -j14.2 mmho to match the line. Note that when working in admittance, the signs of the suscep- tances are reversed with respect to impedances; that is, inductance is -j and capacitance is +j. So for our matching stub, we want an inductance. We can find the length required by going to the infinite conductance point (a short circuit) and rotating toward the generator around the periphery of the chart until we reach the -j14.2 location. Since we started at 0.25 wavefinal point 0.402 lengths. the wavelengths toward the generator means that the stub should be 0.402 -0.25 = 0.152 wavelengths long. The stub thus applied will yield an impedance of .20 + j0 mmho or 50 + j0ohms. Of course, both of these lengths are in line wavelengths. If polyethylene cable is used, the physical length will be only about 65% of free space wavelength.

Transforming from impedance to admittance is the equivalent of going from a series circuit to a parallel circuit. On a Smith Chart, it is easily performed graphically. Use a normalized chart marked unity at the center. Plot the impedance point by dividing each component by the Zo. For example, 50 - i100 would become 1 - i2. Plot the result on the normalized chart. Next, draw the VSWR circle centered on the chart and through the point. Draw the diameter through the point. Read the values at the other side of the circle and multiply the result by Yo, in this case 20 mmhos The result for the example will be 4 + j8 mmho.

The experiment

Using the transmission line setup constructed for the previous chapter, terminate the line in a 150-ohm resistor. Next, take a piece of aluminum foil about 2 inches wide, and wrap it

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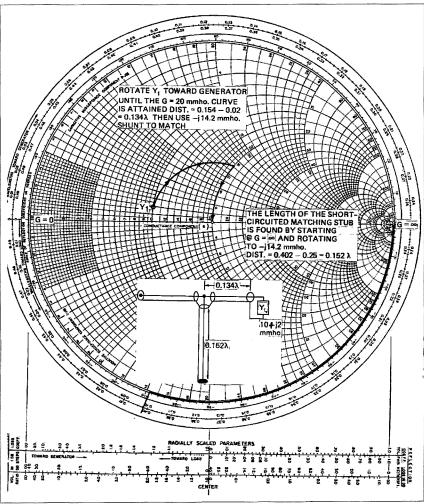
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Continued on page 59 | Fig. 4. Admittance coordinates, 20-millimho characteristic admittance.

by Dave Ingram K4TWJ

On our cover, Jessica Reinhardt KD6ARA (in auto) and Allison Hanson KF6MTG (standing) show us the route to big-time FMing on a limited budget. Jessica is working South American amateurs on $10 \, \mathrm{FM}$ with an Alinco DR-M03_{SX} transceiver, while Allison checks out area 2 meter/70cm action with an Alinco DJ-V5TDC. Now, if we can get the girls to interconnect their transceivers through a pair of quick-brew VOX circuits plugged into mike and speaker sockets, we will also have a neat crossband repeater with globe-spanning range. Yes, and it will have a couple of the best-looking control ops on the band at the helm.



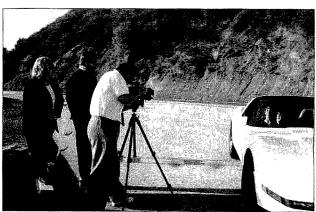


Photo A. Melissa Reinhardt KD6BIT and Jeff Reinhardt AA6JR supervise the photo shoot for this month's cover, done by Jim Paliungas of Palimor Studios, Camarillo CA. The Reinhardts operate Reinhardt & Reinhardt Advertising, Inc., a general-purpose marketing firm located in Agoura Hills CA. Besides several nonham radio clients, they have done work for Alinco, AOR, and Kantronics. Both principals are active hams and enjoy many aspects of the hobby, including HF, VHF, and digital modes. (Photo by Jessica Reinhardt KD6ARA)

n this issue, you'll find a feature review of the DR-M03_{sv} on page 18, and an expanded discussion on 10 FM beginning on page 39 with Steve Nowak's KE8YN/ 4 "On the Go" mobile column. Sorry, guys - neither girl would give out her phone number. You will just have to catch them on the air (the band and mode should be obvious)!

So what is the big attraction of 10 FM? It combines the quiet and squelched rig monitoring capabilities like those of 2 meters with the globe-spanning range of 10 meters. Since it is one MHz above usual 10 meter CW and SSB activities, the MUF (Maximum Usable Frequency) tends to favor 10 FM during regular band openings. As a result, even low power setups with simple antennas "get out" great on 10 FM. A small 10 FM transceiver is also more affordable and easier to mount in an auto than a "do-it-all" rig. Are you getting anxious to try 10 FM, gang? Terrific! Go for it!

The FM talkie Allison is holding in our cover photo also warrants favorable mention. It is a brand-new version of Alinco's DJ-V5T hand-held FM transceiver that operates 2 meters and 70cm, plus has extendable receive coverage from 76 to 999 MHz (less cell frequencies, naturally). This special DJ-V5 version is unique, as it has a clear blue plastic case so you can whip out your pocket magnifier and watch those

tiny electrons flowing during operation (well, that's a good humor thought anyway!). This special version is also geared to operate on readily available "AA" alkaline cells, so batteries and/or a charger are not included -- a fact that makes the little gem's price even more appealing. Who could resist such a deal!? Yes, and remember you saw it first right here in the new 73!



Photo B. Alinco's DJ-V5.

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We are always looking for high-quality color prints or slides for use on our cover. You couldn't use a little extra cash?

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NEUER SAY DIE

continued from page 4

self-destructing, this should be one heck of a year. It's a great way to celebrate 40 years of publishing!

Yes, you can help! I'd like to hear which of our articles and columns you enjoy the most, and which the least. I'll share your votes with Dave. I hope you'll talk about 73 on the air so we can build up the readership. You can E-mail me at w2nsd@aol.com, or snail me at 70 Hancock Road, Peterborough NH 03458. Or even fax me at (603) 588-3205.

Shep

The obit for Jean Shepherd K2ORS made the NH papers. He died "of natural causes" at 78. It's a terrible shame for the world to lose a talent like Shep's. His unique radio show entertained millions nightly for 21 years over WOR. And before that from Cincinnati and Philly. His books are wonderful, and are recommended in my Secret Guide to Wisdom as four star stress reducers. His stories in Playboy won him their humor prizes two or three years in a row. His movies are great, too. I hope you've seen his movies about Christmas and the Fourth of July.

Shep and I used to get together for dinner in New York before his program, or he and his wife Joan would come out on weekends for a day on my boat. I even taught him to water ski, and we'd have evening picnics on a Jamaica Bay beach, with him telling stories.

Anyone who ever heard Shep giving a talk at a hamfest will never forget it.

But, to die at only 78! I hadn't heard from him for the last couple of years, so I didn't know he was sick, or I would have sent him a copy of my Secret Guide to Health. Anyone who follows my instructions isn't going to die at 78 of "natural causes." Or at 98 either. Maybe 128. So we might have had 50 more years to enjoy Shep's creative mind. We all have suffered a loss.

If you are unfortunate enough to have missed hearing Shep's radio programs, he was a humorist, along the line of Garrison Keillor and his Lake Wobegon stories. Unless your sense of humor has rusted out through disuse, you'll enjoy Garrison's books and his weekly broadcasts as much as I do.

Unlike Art Bell, Shep had no guests on his show. And no script. He just winged it, night after night, entertaining millions of his "night people." Shep talked about his childhood days in Gary, Indiana, life around the steel mills, and the foibles of his "old man," mother, and younger brother.

He made one of the top news stories of

the year when he was fired by WOR. Some question had arisen about the potential for his program to sell products. so Shep asked the listeners to suggest some product he could sell, just to prove the power of his show. Someone suggested a soap bar, so Shep asked his listeners to go out the next day and buy a bar of that particular brand of soap. Every store on the East Coast was cleaned out the next day. But rather than using this as a sales tool to sell more ads for the program, the WOR management was furious that he'd promoted a nonadvertiser's product and fired him. Thousands of his fans descended on the studios, down on Broadway, forcing them to hire him back to stop the riot.

Then there was Shep's great *I, Libertine* hoax. Shep had tried to find a book he wanted in a book store, but they looked the title up in the *Books In Print* catalog and said there was no such book. So Shep got even. He had his listeners write in, suggesting the title for a nonexistent book. The winner was *I, Libertine*, by Frederick R. Ewing. Shep then had his audience go into every book store they could find and ask for the book. Sure enough, within days the book was on the *New York Times* best-seller list.

So Bantam books called him and said it was time for him to write the book. Shep got together with science-fiction writer Ted Sturgeon and they wrote the book, which was an instant best-seller. That was Shep's first book.

By a coincidence, Ted's brother Peter was the chap who called me to see if I'd be interested in working with him to start an American chapter of the British group, Mensa. Peter, along with a couple other early Mensa members, met, elected me the secretary, and that's how American Mensa got started. The next few meetings were at my home in Brooklyn. Both Peter and I got fed up with Mensa politics and dropped out. Peter and I still correspond, though he is now living in Vienna.

Serendipitously, a friend found a source for tapes of Shep's radio shows from the 1965 and 1975 eras. Very reasonably priced, too, at \$60 for a set of 12 90-minute tapes. Check out www.intercall. net/-jsadur/shepcat.htm for Max Schmid's catalog. For more Shep stuff, check out www.spacelab.net/-bkays/Shep.html.

We lost track of each other when I moved from Brooklyn to New Hampshire in 1962 and Shep moved from the upper east side of Manhattan to The Village, divorced Joan, put on a lot of weight, grew a beard, and enjoyed the young chick perks of stardom.

Hamfest Speakers

A letter from Dr. Robert Suding

WØLMD complained: "Dayton and several other ham conventions have lost sight of the essentials. They don't advertise. They treat speakers like the convention was doing them a favor by letting them speak. Dayton used to treat speakers royally, free tickets to banquet, etc. This last year I spoke on SSTV, as usual. Only the session moderator, W9NTP, got tickets to the banquet. But it was a blessing. I heard that during the meal they had some acid rock group blasting away at 120 dB. Blew out all the moderators' hearing aids. When the band ended there was no audience! I had a nice quiet dinner



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in Troy, Ohio. Will I ever talk at Dayton again? You gotta be kidding."

It is very discouraging to a speaker to take the three or four days off to speak at a hamfest or convention and then find just a few people in the audience. Why? Mainly because so few of the attendees know the speaker is speaking. A sad fact is that virtually no one takes the time to read the hamfest program book. It goes into the literature bag to be read later. A later that, unfortunately for the sucker companies who've bought ads in the book, never comes. Oh, I used to advertise in convention programs, but I didn't get any subscriptions as a result. None. I found that hams don't read program books.

Few hamfests bother to put up posters telling who is speaking, when and where, and even fewer make public address announcements. I probably made lifetime enemies in Atlanta when I reported on the last Atlanta hamfest I attended, where I counted the attendance at the various speaking sessions. It went from zero to about a dozen for most talks. And the same goes for Dayton, where it has never been easy for attendees to get speaker information.

I used to pull a couple hundred people for my talks, but I'll bet that if the Hamvention had done some serious promotion I'd have pulled a couple thousand. And there seldom was any time that the Hamvention officials made me feel appreciated or special. Last year I was invited to speak at the Peoria Hamfest and they did it right, despite their having to make do with a poor hamfest site. They paid my expenses of getting there and gave me three speaking opportunities, each with a good crowd, and made it clear that they really appreciated me coming.

I asked Shep K2ORS why he didn't give more talks at hamfests. His talks have always been class-A entertainment. He advised me to charge at least \$1,000 to give a talk. He said that unless the hamfest committee has to pay for you to come, you don't get much promotion from them, nor any consideration.

So I started charging to talk at hamfests and, sure enough, when they were paying me \$1,000 plus expenses, they made damned sure in their hamfest promotion that everyone knew when and where I'd be speaking. The result was packed houses.

Bob Heil K9EID, who is a real showman, did this for the hamfest he organized in St. Louis and it pulled in a huge crowd. I think Bob had over 2,000 in the auditorium that day for my talk.

Hamfests should be using ham super stars to build bigger attendance. We have hams such as Dave Bell W6AQ, Art Bell W6OBB, Ken Miller K6IR, Joe Walsh WA6AQU, and Ross Adey K6UI, who should be headlining at ham conventions. And Bob Suding WØLMD. And, most certainly, Lester Earnshaw of Kachina. There are a bunch of hams who could perk up convention attendance. Get on the stick, hamfest organizers.

I'm available if you pay my expenses, plus agree to put the \$1,000 speaking fee into the hamfest promotion. I'll even come a day early if you can line up some local radio and TV talk shows for me to help promote the hamfest.

Crash?

Our stock market has been rising and rising, and this despite the mounting problems in Asia, plus less than assuring conditions in Europe. There are the continuing troubles in Yugoslavia, the drain upon a Germany trying to assimilate basket-case East Germany, the currency problems of the new European currency, and so on.

If enough people get worried about what some major catastrophe might do to our banking system and, just to be safe, withdraw a few hundred or even a few thousand dollars, that alone could trigger a panic. Or if even a relatively small number of people decided that, just to be safe, it would be prudent for them to get out of the market until they are sure that the market is stable, that would pffft everything. The stock market has always delicately balanced, with even slight emotional winds causing serious changes.

Russia is in terrible shape. China is torn between raging business growth and the increasing fear of the communist establishment that they will lose control. Indonesia is in turmoil. Japan hasn't come up with any good answers to the fundamental weakness of their banks. South Africa is crumbling. There are mini-wars and serious problems all through Africa, with no country looking like a good bet for the future. There are religious and tribal wars at every turn.

Then we have the tulip bulb-like investments in Web businesses, where rumors zoom stocks up and down like yoyos. Bill Gates makes or loses a few billion dollars every day.

So, considering all this uncertainty and the potential for disaster, where should prudent people place their bets? Is it better to ride the wave or to bail out? Would a person do better holding stocks, cash, gold, silver, or ... or what?

The stock market is at an astronomical high and way beyond sustainable prices. So, if the market starts correcting, that could trigger a sell-off, which would drive prices down even faster. And this would quickly stop people from buying

anything but the basic necessities, collapsing the retailing and manufacturing sectors. And their downturn of expected profits would feed the market selling frenzy.

Housing starts, car buying, and even that newer, faster computer purchase would be put on hold.

And all that doesn't factor in the potential long-range impact of the Y2K bug. Our whole civilization is like a house of cards, with so many things being interdependent.

Campaign Reform

It ain't gonna happen, Charlie. In a review of *The Corruption of American Politic* by Elizabeth Drew in *Business Week*, she has come up with the same solution to campaign reform as I and Tom Sowell have: just stop re-electing politicians. As long as you either vote for them or don't vote at all, you are endorsing campaign corruption.

Politicians spent \$532 million of your money on TV ads in the 1998 mid-term elections. Lobbyists eagerly give the pols money just so they'll be able to get to meet with them when something comes up affecting one of their clients. Lobbyists encourage politicians to threaten industries with hearings as a way to shake the money tree. This approach is called "Astroturf" by lobbyists.

But, as long as the fox is guarding the henhouse, we're not going to see any substantive changes. How many people will vote themselves a cut in pay?

The end result of this corruption is that big business interests are running the government, not ours. We're told we are living in a democracy, but that's just another scam. We dutifully vote the way they want us to with the TV political ads their money buys.

So we pay a little more for cars, steel, airline tickets, and all the products advertised on TV in order to keep thousands of lobbyists in BMWs and Congress awash in campaign money. We pay more for our schools, health care, and so on as these industries siphon part of our money into Washington. Half a trillion dollars last time. Who'll bid a trillion? We will.

Those SATs

Betcha didn't know that in the early '60s, when the student SATs peaked, less than 25% of all public school teachers had a postgraduate degree. 15% didn't even have a bachelor's degree! Twenty years later, as the SATs plummeted, more than half of all teachers had master's degrees and under one percent

Continued on page 62

Mobile, Portable and Emergency Operation

Steve Nowak KE8YN/4 1011 Peacock Ave., NE Palm Bay FL 32907-1371 [ke8yn@netzero.net]

10 Meter FM is Getting Hot!

Ten meters has great potential for working DX at reasonable power levels without filling up the inside of the car with equipment. It is primarily a daytime and evening band, which fits in nicely with most people's commuting schedule. The ten meter rigs that are being offered today are comparable in size to VHF or UHF mobile rigs and should be able to fit in virtually any vehicle.

Like many of you, I spend a reasonable amount of time commuting to and from work each day. Also like you, I use my drive time as an opportunity to get in a little ham radio activity. While 2 meters and 440 MHz are fun, there is only so much you can do through the local repeater. With the sunspot activity increasing, there is no doubt that HF soon will be the place to be.

Now, there are a number of ways to approach HF, with some operators sprouting a multiband antenna on the vehicle and having equipment for working all modes from RTTY to CW. This can be a tremendous amount of fun, but also can entail an equally large investment. After all, can you really compete with the kilowatt stations on twenty meters using a mobile rig? Even if you put a linear amplifier in the trunk, stacked monobanders still provide more signal than

a fender-mounted vertical. There is, however, an ideal band and mode for mobile and portable operation — ten meters.

Mobiling on 10

Ten meter rigs (**Photo A**) are easy to use, often well equipped with "creature features," and remarkably inexpensive. In addition, ten meter antennas are modestly sized and can be readily mounted on any type of mount from a fender-mounted ball to a magnet mount on the roof or trunk (**Photo B**). And, as we mentioned above, ten meters is great for mobiling because the rigs can fit into almost any vehicle.

AM lives on 10

While sideband operation is the standard voice mode for the high frequency bands,

ten meters provides a couple of additional options. While AM has lost a lot of popularity on many bands because of its wide bandwidth compared to single sideband, this is not necessarily true on ten meters. There have been a lot of citizens' band radios converted to ten meter use that have retained the AM mode. Generally, the AM portion of the band is between 28.965 MHz and 29.405 MHz, and there are standardized correlations for ten meter frequencies that reflect a 2 MHz conversion from CB channels.

10 FM: Fantasy land!

The most interesting operating mode on ten meters is ten meter FM. If you take the best features of VHF, UHF, and HF you have an idea what ten meter FM is like. FM presents some distinct advantages. Remember that FM is different because it exhibits capture effect, which means that when more than one FM signal is on a given frequency, an FM receiver will tend to "hear" or capture only the strongest signal. While this does not eliminate all interference, it is significantly less of a problem than it is in AM or sideband operations. Likewise, FM is not as seriously impacted by atmospheric noise as are other modes. For operating 10 meter FM, 29.600 MHz and 29.480 MHz are used for direct two-way communications.

If FM is so great, why don't we use it on every band? Well, don't forget that FM does require a fairly wide bandwidth. Ten meters has the advantage of offering a reasonable range of frequencies, so there is space for wider bandwidth operations. With the ability to operate FM, you find that this is a great band for repeater operations, and this is where the fun begins. There are ten meter repeaters scattered all over this continent. Unlike VHF or UHF repeaters that serve a

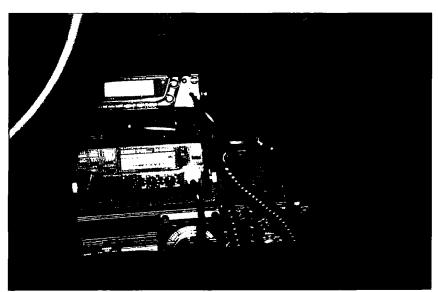


Photo A. Room for one more — Alinco DR-M03 mounted on top of 2m/440 and HF rigs.

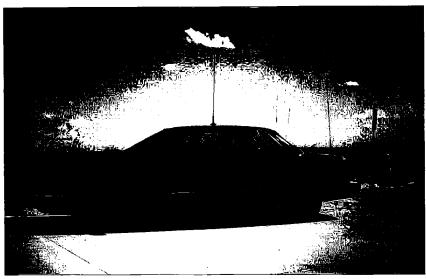


Photo B. 10 meter antenna mag-mount on roof complements 20 meter and VHF/UHF. antennas on trunk lid.

	10 Meter FM Frequencies	
29	.48 MHz Simplex Frequer	ncy
29.60 M	Hz National FM Simplex F	requency
	10 Meter Repeaters	
nput (MHz)	Output (MHz)	· · · · · · · · · · · · · · · · · · ·
29.52	29.62	
29.54	29.64	····
29.56	29.66	
29.58	29.68	
A	RRL 10 Meter CTCSS Pla	an
Call Area	Tone 1	Tone 2
W1	131.8	91.5
W2	136.5	94.8
WЗ	141.3	97.4
W4	146.2	100.0
W5	15 1 .4	103.5
W6	156.7	107.2
W7	162.2	1 10.9
W8	167.9	114.8
W9	173.8	118.8
WØ	179.9	123.0
VE	127.3	88.5

Table 1. Copy-and-clip 10 meter frequency chart.

single area with a radius of fifty miles or so, these 10 meter FM repeaters serve the entire world. From my car using a magnetic mount antenna and 10 watts while driving along the east coast of Florida, I can hit repeaters from Puerto Rico to Boston. Stations with more power and a better antenna can hit the same repeaters from virtually anywhere. It is not uncommon to hear a mobile in the U.S. working DX stations throughout Europe, Australia, or other exotic locations — one right after another.

The 10 FM bandplan

Most ten meter repeaters are set up in a fairly standard fashion with an input frequency offset from the output frequency. Standard offset for the input is 100 kHz down from the output, so a repeater that transmits on 29.62 MHz would receive signals on 29.52 MHz. The standard output frequencies for ten meter FM are 29.62, 29.64, 29.66, and 29.68 MHz, with the input frequencies down 100 kHz (29.52, 29.54, 29.56, and 29.58 MHz, respectively.) A "copy-and-clip" chart of this is given in **Table 1**.

Tones on 10 FM

With only four frequency pairs, you might expect that there could be a problem with interference between repeaters. In most cases, this will not be an issue due to the differences in propagation — more on that later.

However, as with repeaters on the frequencies, it is possible (and very easy) to use CTCSS, sometimes called PL tones. This technique uses a low frequency tone that is transmitted along with the carrier. The tone is set for a given repeater to prevent interference from signals on the same frequency aimed at other repeaters. In actuality, however, the CTCSS tones may be more of a hindrance than a benefit since propagation will determine which repeater you will hit.

In 2 meter FM, the signal is line-of-sight from your antenna to the repeater. In 10 meter FM, some people may have the ability to contact the repeater by ground wave, but most of us will have our signal bounced between the Earth and the ionosphere one or more times before it hits the repeater. Since the ionosphere reflects differently depending upon the time of day and the conditions dictated by the 11-year sunspot cycle, the point at which the signal returns to Earth will often determine which repeater is available.

Listings are free of charge as space permits. Please send us your Calendar Event two months in advance of the issue you want it to appear in. For example, if you want it to appear in the April issue, we should receive it by January 31. Provide a clear, concise summary of the essential details about your Calendar Event.

JAN 8

LOVELAND, CO The Northern Colorado ARC will host their Superfest from 9 a.m.-3 p.m. at the Larimer County Fairgrounds, 700 Railroad Ave. VE exams, commercial exhibits, computers, radios and more. Reserve tables from Michael Robinson N7MR, (970) 225-7501; or [michaei@frii.com]. Talk-in on 145.115 (-100 Hz) or 146.52. For detailed information, see the Web page at [www.info2000.net/ ~ncarc].

JAN 9

SOUTH BEND, IN The Michiana Valley Hamfest Assn. will sponsor the 23rd Annual South Bend Hamfest & Computer Expo, Sunday, Jan. 9th, 2000 at 8 a.m-3 p.m., downtown at the Century Center (US Bus 31 North at Jefferson Blvd.). There will be a large flea market featuring manufacturers, dealers and swappers of amateur radio equipment and computer hardware/software. Setup Sunday at 6 a.m. Talk-in on 145.290(-). 5 ft. round tables are \$5 each; 8 ft. rectangular tables \$15 each.; 8 ft. rectangular wall tables \$20 each. Advance tickets \$4 each. Electric power \$26.25. Make check or MO payable to MVHA and mail to Michiana Valley Hamfest Assn., 21970 Kern Rd., South Bend IN 46614. For info or ordering, please send business-size SASE. Contact Denny KA9WNR, M-F 7 p.m.-10 p.m. EST at (219) 291-0252.

JAN 15

ST. JOSEPH, MO The 10th annual Northwest Missouri Winter Hamfest will be held on Jan. 15th, 8 a.m.-3 p.m. at the Ramada Inn in St. Joseph. There will be special room rates for hamfest participants. The motel is located at I-29 and Frederick Ave. (exit 47 on I-29). Talkin on 146.85 and 444.925. VE exams, major exhibitors, and flea market all indoors. Free parking. Admission \$2 each or 3 for \$5 in advance; at the door, \$3 each or 2 for \$5. Swap tables 6 ft, by 2.5 ft. are \$10 each for the first two tables, 3 or more for \$20 each. This includes two chairs and a ticket. Commercial exhibitors welcome, write for details: Northwest Missouri Winter Hamfest, c/o Dick Merrill KCØAMY, P.O. Box 1533, St. Joseph MO 64502; or call (816) 279-2304.

JAN 16

HAZEL PARK, MI The Hazel Park ARC will

hold their 34th Annual Swap & Shop at the Hazel Park High School, 23400 Hughes St., Hazel Park MI. Open to the public 8 a.m.-2 p.m. General admission is \$5 in advance or at the door. Plenty of free parking. Tables are \$14 each and reservations for tables must be received with a check. No reservations by phone. Talk-in on 146.64(-) the DART reptr. For more info about the swap, tickets or table reservations mail with an SASE to HPARC. P.O. Box 368, Hazel Park MI 48030.

RICHMOND, VA The Richmond Amateur Telecommunications Society (RATS) will hold Frostfest 2000 at the Showplace-3000 Mechanicsville Tpke., Richmond VA. From I-95, Exit 75 to I-64 East, then Exit 192 (Rt. 360 East); go 1/2 mi. on left. Open 8:30 a.m.-3:30 p.m. Handicapped accessible. Talk-in on 146.88. There will be indoor dealers, a flea market, and forums. Admission \$6. Call (804) 330-3165 for reservations; or write Frostfest 2000, P.O. Box 14828, Richmond VA 23221-0828. For general info, call (804) 739-2269. Box FEST. Visit the Web at [http://frostfest. rats.net1.

YONKERS, NY The Metro 70 cm Network (WR2MSN) will present their Computer and Electronic Flea Market at Lincoln High School, Kneeland Ave., Yonkers NY, starting at 9 a.m. Vendor setup at 7 a.m. Free parking. Ad- mittance is \$6; under 12 years free, Talkin on 440,425 PL 156.7; or 146.910 PL 114. Vendors should call WB2SLQ after 7 p.m. at (914) 969-1053; or E-mail [Wb2slq@juno.

Continued on page 42



CALENDAR EVENTS

continued from page 41

com] to register. This show will be held all-indoors.

JAN 23

BABYLON, NY A special day of education for amateur radio will be held on Long Island on Sunday, Jan. 23rd, 2000. This event will include technical forums on all aspects of amateur radio. It is not a flea market or hamfest. There will be no items for sale. Some of the forums will be on license restructuring. antennas, DXing, contesting, purchasing amateur radio equipment, packet, FLEXNET, ARES, APRS, satellite communications, and QRP (low power). There will also be a YL forum on issues concerning women amateur radio operators, and even more forums for everyone. In addition, there will be information booths for all the participating amateur radio clubs in the New York City/Long Island area, as well as booths for the ARRL, QCWA, a tune-up clinic and DXCC/WAS card checking. The event is "Ham Radio University 2000" and will be held Sunday, Jan. 23rd at the Babylon Town Hall Annex on Phelps Lane in Babylon NY. It will be open to the public 9 a.m.-3 p.m. Donation \$2.00, Spouses, and children under 12 will be admitted free. Ample free parking. For more info contact Phil Lewis N2MUN at [iewisp@ hazeitine.com] or call (516) 226-0698. The talkin will be on the Great South Bay ARC repeater on 146.685, 136.5 PL.

JAN 30

DOVER, OH The Tusco ARC Hamfest will be held at the Ohio National Guard Armory, 2800 North Wooster Ave., Dover OH. Exit Interstate 77 at Exit #87 (Strasburg). Turn right at the exit stop sign, heading south on County Road 74 to the first traffic light. Continue through the traffic light intersection. The armory is on the right. Talk-in/check-in on 146.730(-). Admission is a \$3 donation at the door. Dealers admitted at no charge. Tables are \$10 each. The building opens at 6 a.m. for setup and will be open 8 a.m.-1 p.m. for the public. Food will be available on site, and after 7 a.m. at the restaurant next door. An ARES forum will also be featured. For more info and to reserve tables, contact Billy L. Harper KB8CQG, P.O. Box 80407, Canton OH 44708, Tel. (330) 484-4634; Fax: (330) 484-4683; E-mail [bharper@ neo.rr.com].

ODENTON, MD The Maryland Mobileers ARC of Glen Bumie MD will host a Post Holiday Hamfest at Odenton Vol. Fire Dept. Hall, 1425 Annapolis Rd. (Rte. 175), nine miles east of I-95. Indoor flea market, no tailgating. Free VE exams (pre-register with *Jerry Gavin NU3D*, (410) 761-1423). Free parking. Talk-in on 146.205/.805. Tables in advance. Contact Bill Hampton N3WGM, 7609 McGowan Ave., Glen

Burnie MD 21060; or call (410) 766-2199;. E-mail to [diamondb@space4less.com]. Visit the Web site at [www.space4less.com/usr/mmarc].

FEB 5

NORTH CHARLESTON, SC The 27th Annual and Original Charleston Hamfest and Computer Show will be held at Stall High School in North Charleston, 8:30 a.m.-4 p.m. Setup Fri., Feb. 4th, 5 p.m.-9 p.m.; Sat., Feb. 5th, after 6:30 a.m. The school is located near I-26 and Ashley Phosphate Rd. Several malls nearby. Talk-in on 146.790(-), (the WA4USN linked repeater system aboard the USS Yorktown), and the 145.250(-) repeater near Summerville. Other area repeaters are 147.180(+), 146.940(-), 147.270(+), 147.345(+), 146.760(-), 147.150(+), and 443.800(+). Tickets \$5 at the door on Saturday morning (1 prize ticket included). Additional prize tickets are \$1 each or 6 for \$5. Children under 12 admitted free, 8 ft. tables \$8 in advance, \$10 at the door, as long as they last. Make check payable to C.A.R.S. Hamfest Committee, and mail with an SASE to Jenny Mvers WA4NGV. 2630 Dellwood Ave.. Charleston SC 29405-6814. VE exams will be given on site. Please bring an original and copy of your Social Security number, amateur license, any CSCEs you have, and two IDs, one with a photo. All testing will be on a walkin basis and will begin at 12 noon. For more info call Ed KE2D at (843) 871-4368, or E-mail [efrank@charleston.net]; or call Doc W4MUR at (843) 884-5614.

FEB 6

LORAIN, OH The Northern Ohio ARS will sponsor Winterfest 2000 at Gargus Hall, 1965 N. Ridge Rd., Lorain OH. Mobile check-ins and directions will be provided on NOARS repeaters 146.700(-) and 444.800(+). All indoor commercial space, reservations required. 6 ft. tables are \$10 each. All workers require an admission ticket. Setup for vendors begins at 6 a.m. Doors open to the general public at 8 a.m. Tickets \$5 at the door. For more info contact John Schaaf KC8AOX at (216) 696-5709; or write NOARS Winterfest, P.O. Box 432, Elyria OH 44036-0432. E-mail to [noars@qsl.net].

FEB 7

SUN CITY, AZ The West Valley ARC will hold an amateur radio equipment auction at St. Clement of Rome Catholic Church Social Hall, 15800 Del Webb Blvd., Sun City AZ (1/2 mile S of Bell Rd.). Free admission. The club keeps 10% on equipment sales. Talk-in on 147.30(+). Contact Fred KC5AC at (623) 214-7054; or Email [kc5ac@arrl.net].

FEB 11-13

ORLANDO, FL The Orlando ARC will sponsor

the 53rd Orlando Hamcation Show and the ARRL State Convention, at the Central Florida Fairgrounds, located on Rt. 50 Colonial Dr., 3 miles west of I-4. Open Fri., Feb. 11th, 5 p.m.-9 p.m.; Sat., Feb. 12th, 9 a.m.-5 p.m.; and Sun., Feb. 13th, 9 a.m.-3 p.m. Over 150 commercial booths, over 400 swap tables. RV camping with elect, and water, \$16 per night in advance or \$20 at the gate. Admission \$7 in advance or \$9 at the gate. Commercial booths \$225, swap tables \$35 in advance or \$45 at the gate. Tailgate \$25 in advance or \$35 at the gate. Price is for three days. Setup Fri., Feb. 11th, 9 a.m.-4 p.m. Talk-in on 146.760(-). VE exams, must register in advance. Call Gil Lineberry at (407) 843-4112. You can join the foxhunt by registering by 4 p.m. at the info booth. Seminars, lectures, demonstrations, and special guest speakers. Check the Web site for up-to-date info at [www.oarc.org/ hamcat.html]. Contact Ken Christenson, 5548 C Cinderlane Pky., Orlando FL 32808; tel. (407) 291-2465; or E-mail [KD4JQR@arrl.net].

FEB 12

RENO, NV The Reno Millennium Hamswap and Sale will be sponsored by the University of Nevada Radio Pack Club. This event will be held at KNPB Channel 5, 1670 N. Virginia St. in Reno starting at 8 a.m. Bring your out-of-use equipment from garage and shack. There will be ample parking and no admission or table cost. Bring your own table. Talk-in on the W7UNR rptr. 145.29(-) split; the RAMS rptr. 147.06(+) PL 123; and 444.800(+) PL 123. A raffle, coffee and donuts will be available at the swap. E-mail Gary K7VY at [k7vy@arrl.net]; or Glen KK7IH at [kk7ih@arrl.net].

FEB 13

MANSFIELD, OH The Mansfield Mid*Winter Hamfest and Computer show will be held Sun., Feb. 13th at the Richland County Fairgrounds in Mansfield. Doors open to the public at 7 a.m. Tickets are \$4 in advance, \$5 at the door. Tables are \$10 in advance, \$12 at the door, if available. Advance ticket/table orders must be received and paid by Feb. 1st. For additional info on advanced tickets or tables, send SASE to Pat Akerman N8YOB, 63 N. Illinois Ave., Mansfield OH 44905; or tel. (419) 589-7133. For talk-in call W8WE on 146.34/.94.

FEB 19

ELMIRA, NY The Amateur Radio Assn. of the Southern Tier will present its 19th Annual Winterfest. Saturday, Feb. 19th, 8 a.m.-3 p.m. at the Elmira College Murray Athletic Center Domes, on NYS Rte. 14, 5 miles north of Horseheads NY. Talk-in will be on 146.700(-). There will be dealer displays of new equipment, and a huge indoor flea market. Breakfast and lunch will be served on the premises. Admission is \$5 at the door; children

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10 and under are admitted free. VE exams start at 9 a.m., walk-ins welcome. For dealer and table rental inquiries, contact Gary N2OKU at (607) 739-0134.

OBERLIN, PA The Harrisburg RAC will present their 2000 Winter Hamfest at the Citizens Fire Company of Oberlin, Saturday. Feb. 19th. Directions; J-283 to Swatara/PA-441 Exit #1. Turn north onto PA-441 (toward Bob Evans Restaurant). Turn left at traffic light onto Eisenhower Blvd. Turn right at the next traffic light, remaining on PA-441. Turn right at stop sign. The Fire Hall is 0.2 miles on the right. General admission \$3 (XYLs, harmonics free). Inside tables \$8 each. Tail-freezing tailgating \$1 per space. For table reservations contact Dick Bordner N3NJB, 2501 South 2nd St., Steelton PA 17113. Tel. (717) 939-4825; or Email [N3NJB@aol.com]. See the Web site at [http://hrac.tripod.com].

RICKREALL, OR The Salem Repeater Assn. and the Oregon Coast Emergency Repeater, Inc., will present the 2000 Salem Hamfair, Saturday, Feb. 19th at the Polk County Fairgrounds in Rickreall, 9 a.m. until the end of the 3 p.m prize drawing. Pre-registrations post marked by Feb. 4th will receive an extra door prize ticket with each registration. For answers to Hamfair pre-registration questions, call Evan Burroughs N7IFJ at (503) 585-5924; or E-mail to [n7ifj@teleport.com]. Parking for self-contained RVs on the fairgrounds is just \$10 per night per RV. Indicate which nights you wish to park and include the fee with your hamfair registration. Talk-In on 146.86(-). Commercial venders will include Icom. Ham Radio Outlet, StarFire Tech, Capital Engraving, Radio Depot Emergency Communications Supply, and many more.

FEB 20

FARMINGTON HILLS, MI The Livonia ARC will hold its 30th annual Swap 'n' Shop Sunday. Feb. 20th. 8 a.m.-12 noon at the William M. Costick Activities Center, 28600 Eleven Mile Rd. (between Middlebelt and Inkster Rds.) in Farmington Hills. Talk-in on 144.75/5.35. For info, send a 4 x 9 SASE c/o Neil Coffin WA8GWL, Livonia ARC, P.O. Box 51532, Livonia MI 48151-5532; or call the club phone line at (734) 261-5486. The club Web page is at [www.larc.mi.org]. Send E-mail to [swap@ larc.mi.org].

FEB 26

LA PORTE, IN The LPARC Cabin Fever Hamfest will be held at the La Porte Civic Auditorium, 1001 Ridge, 7 a.m.-1 p.m. Chicago time, Admission \$5, Tables \$5, Talkin on 146.520 and 146.610(-) PL 131.8. For more info contact Neil Straub WZ9N, P.O. Box 30, La Porte IN 46352. Tel. (219) 324-7525; Email [nstraub@niia.net].

MILTON, VT The Radio Amateurs of Northern Vermont will sponsor the Northern Vermont Winter Hamfest and ARRL Vermont State Convention, 8 a.m.-3 p.m. at Milton High School, Route 7 in Milton (5 miles north of I-89 Exit 17). Talk-in on 145.15 rptr. Features include a flea market, forums, auction. dealers, book sales, exhibits and refreshments. Admission is \$3, free for under 18 years. Tables are free while they last. For large setups, call W1SJ at (802) 879-6589. or E-mail [w1sj@ arrl.net]. The Web site is at [http://www.ranv.together.com]. VE exams will be given at 9 a.m. and 2 p.m.; commercial exams at 2 p.m.

FEB 27

ANNANDALE, VA The Vienna Wireless Society's 24th Annual Winterfest will be held at the Annandale campus of Northern Virginia Community College. Coordinates: N38 49,96'; W77 14.28'. From the Capital Beltway, take Exit 6 West, turn left onto Wakefield Chapel Road; after 0.2 mile, turn left. The indoor area opens at 8 a.m.; tailgating area opens at 6 a.m. Talk-In on 146.31/.91. Admission \$5, XYLs free. Tailgating \$10. DXCC field checks. For info phone Jim WA4LTO, (703) 392-0150; E-mail [k3mt@erols.com]. Visit the Web at [http:// users.erols.com/k3mt/vws1 for more info. VE exams at 8 a.m. sharp.

Open to the public 9 a.m. Sunday Feb. 27th. General admission \$6, children under 12 free. Free parking available. Vendors, all spaces \$25 each, each space includes one 6 ft. table and admits one person. Advance registration only. no tables sold at the door. Send check to LIMARC, P.O. Box 392, Levittown NY 11756-0392. Contact Hamfest Chairman Eddie Muro KC2AYC at (516) 791-7630 or [hamfest@ limarc.org]. Features include amateur radio equipment, CB equipment, TV, VHF tune-up clinic, computers. ARRL information, and ham equipment dealers.

MAR 4

KNOXVILLE, TN The Shriners of Kerbela ARS will sponsor their annual Hamfest at Kerbela Temple, 315 Mimosa Ave., Knoxville TN, 8 a.m.-4 p.m. Admission is \$5. Indoor vendor tables are \$8 each plus admission of \$5. Setup Friday 4 p.m.-8 p.m.: and Saturday 5 a.m.-8 a.m. Overnight security will be provided. Talk-In on 144.83/145.43 or 146.52 simplex. Smoking indoors is permitted in designated area only. Contact Kerbela Amateur Radio Service, Kerbela Temple A.A.O.N,M.S., 315 Mimosa Ave., SE, Knoxville TN 37901.

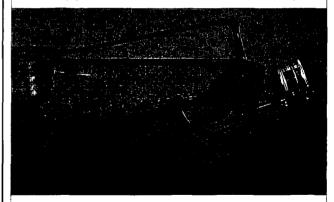
Say you saw it in 73!

CUYAHOGA FALLS. OH The Cuyahoga Falls ARC, Inc. will sponsor their 46th Annual Hamfest. Electronic and Computer Show, Sunday Feb. 27th, 8 a.m.-2 p.m., at Emidio's Party Center, 48 E. Bath Rd. at the corner of State Rd., Cuvahoga Falls, For more details contact Carl Hervol, Hamfest Chairman, (330) 497-7047; or send E-mail to [carlh@ pop.raex.

HICKSVILLE, NY The 2000 Long Island Mobile Amateur Radio Club Winter Hamfest will be held at Levittown Hall, 201 Leavittown Parkway, Hicksville, east of the Wantagh Parkway (Exit W2 East), 1/2 mile south of Old Country Rd. on Levittown Pkwy. Talk-in on W2VL 146.85 rptr. PL 136.5.

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Noise and Its Amateur Implications

Noise in its broadest terms is something we are all familiar with. Noise from mechanical devices, electrical devices, and all sorts of things all add up to make noise a part of our every-day life. Noise from the dog at 3 a.m., noise even from our grandchildren at play can really make you wish you could turn down their amplifier and have some peace and quiet. While turning down the noise source is a good idea, it's not possible in the modern world (electronically speaking) that we live in. Unfortunately, we must confront head-on the contributions of noise produced by all the technology that we have become accustomed to using.

The real fight for survival is inside our L equipment and in the design of devices to counter this noise problem. While I don't want to go into noise blankers and other receiver noise circuits, I do want to take a slightly different tack and go into identifying the noise sensitivity of receiving systems and preamps in general. What is interesting to note is that all receivers contribute noise to the receiving system, with some better (less noise) than others. This internal noise product is what we are examining in receiving systems, be it a preamp or receiver. We want to identify just what inherent noise each component amplifier part is capable of supporting. Eliminating noise completely is not possible, as all devices make or generate noise as a function of current flow. While other devices try to selectively sort through this noise and pull out real signals, adjusting first stage amplifiers for minimum noise figure produces the best results.

That's the real topic for radio amateurs — pulling very weak signals out of the gobbledygook we all refer to as "noise." I am sure if we listen to noise long enough we can even make a contact with some rare callsign. Humor aside, we all have listened for long times to find weak signals. both real and imaginary, trying to fish a contact out of the noise while searching up and down the band adjusting our antenna and peaking our receiver for best performance.

Noise is what we hear when we unsquelch our handhelds or listen to a high frequency receiver — it's all noise, at least until a real signal hopefully comes roaring through. We can take a signal generator and examine almost any receiver to find out its minimum sensitivity in microvolts and how much gain it gives, but this does not give a urue picture of the system performance. What is needed is a measurement of noise figure.

Noise figure is a ratio used to rate each system or component amplifier of a system. The lower the noise figure number you can obtain, the better your system will be able to pick a very weak signal out of the external noise. There is, however, a requirement that the weak signal you expect to find is higher in level than the ambient or external noise. In other words, if the signal you want is on even par with elevators, generators, and automobile ignition systems (to mention a few contributing noise sources), there is not much that will allow you to receive a workable signal. Even the neighbor's Mixmaster can wipe you out with noise and make your receiver unworkable, at least until the cake mix is finished.

Remembering back to my HF days as a Novice, I was always adding on to my HF receivers' adjuncts to improve sensitivity and performance without having test equipment to evaluate just what improvements my system was capable of detecting. In those early days I did not realize that the HF receivers, hot as they were, did not need much improvement as far as noise figure was concerned, as the external noise was so great there was little that could be done to improve the receiver to overcome it. To be able to copy signals that are below this threshold ("signals below the external noise floor"), other special techniques are required.

My first noise meter was a simple diode noise source serial #2, a prototype found at

a local surplus store. It was used to evaluate military receivers from 1 to 400 MHz. Or rather, instead of testing them, it was supposed to be used first when the receiver was new to make a noise reference meter reading and record it for maintenance checks. It was then used to test all receivers of a specific type, and at a specific frequency have a meter reading of, say, 5-7 on the reference scale. If it went to a larger number. the receiver was getting numb and needed service. What a neat device for a quick evaluation confidence check of a system receiver, as it did not require extensive calibration. (This was for AM, CW, and SSB receivers only. It will not work for FM.)

Later on, the pursuit for better noise figure (without the capability of measuring it) was hot underway. Operation on 2 meters and above was all the rage. First came the Gonset Communicator (a tube radio) and its RF amp, a 6BQ7 with a NF of 7 dB or so at 2 meters. New improvements came on, as the Nuvistor touted then as sort of a solid state miniature tube (the 6CW4) with a NF of about 3 to 4 dB. To really get the best noise figure at this time, the ultimate at 2 meters was the historic Western Electric 416B gold-plated lighthouse tube. Noise figures in the 1 dB range were at hand, but at a price — that being a supply of pressurized air to prevent the glass seals from cracking from tube heat. Not to mention a high voltage DC power supply for the 416B and its \$50 price tag.

Then entered the solid state transistors from Texas Instruments called the TIXM05 and its family of devices that equaled the 416's 1 dB NF and was solid state and about

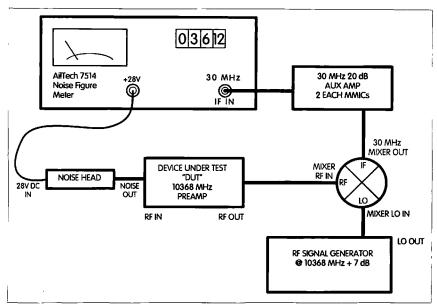


Fig. 1. Ailtech 7514 noise figure meter connected to noise head. Noise head produces RF noise to input of "DUT" (Device Under Test) preamplifier and is converted with an external signal generator and microwave mixer to 30 MHz, the IF frequency of the 7514 noise figure meter. A small 10 to 20 dB amplifier is required to overcome the loss due to mixing conversion loss. 30 MHz preamp can be constructed with 2 stages of most any MMIC amplifier.

1/20 of the tube's weight. Believe it or not, while looking through the junk box that I build from. I located several TIXM0 devices still in their original package. What a find — I had forgotten all about them lying in the junk box from the late '60s. (I should start a radio sideshow of old and interesting devices.)

Since in those days science in general exploded, with 1 dB noise figure at 2 meters came improvements holding the NF to below I dB but at increasing frequencies with bipolar devices and then GaAsFET devices. Not to just 1 GHz but into the very microwave region that I love to play in today. Obtaining a 1 dB NF preamp at 10 GHz is nothing today with modern FETs. What is left after constructing such a preamplifier or system is the adjusting and measuring that is required to obtain best adjustment and lowest noise figure (NF). What a comparison to the early 2 meter struggling for a modest noise figure with tubes before transistors and FETs.

Just for fun and to demonstrate how good material is today. I bandsawed a Qualcomm 12 GHz Low Noise Amplifier (LNA) out of a major assembly, put isolation capacitors and two coax connectors on the preamp, and took it to the NF measurement at Microwave Update 1999 in Plano, Texas. It measured at 10368 MHz 27 dB gain, and a 2.13 dB NF out the chute with no prior testing

or adjusting by me after sawing the unit out of a much larger component. Compare that to my efforts quite a few years ago with tubes and the first transistors, and you can see that we have come a long way as amateurs, and in electronics in general.

What, then, are the noise improvements that need to be made to a preamp or circuits to make them better and allow weaker signals to be received using the same device and circuit such as my amp described for 10 GHz? The procedures are the same for any frequency, be it 1 GHz or 10 GHz. Only construction and circuit size gets smaller and smaller as frequencies increase, making them more difficult to cope with as circuit size diminishes. Tools shift from longnose pliers and wire cutters to tweezers and Xacto knives. Also, it is necessary to employ a noise figure meter to properly evaluate the circuit for best adjustment for lowest noise figure. The noise figure test equipment must be utilized to make this adjustment. While the preamplifier under test in this example exhibits good gain, minor readjustments in device drain current and bias voltage, with small circuit parameter changes in capacitance and inductance. can turn a functioning preamp into an excellent-low-noise-figure preamplifier.

Well, what does this magical device, the noise figure meter, have that is so special? First, it must have a source of noise, a diode noise source that is calibrated to a specific power in dB (rated in dB or called ENR, excess noise) over a specific frequency range. These specifications are usually labeled on individual noise heads. Its power is called Noise Source Excess Noise. One commercial noise head I have came with a Sanders 5400B noise figure meter (military surplus). This noise head is rated at 25.5 dB (ENR) excess noise from 1 MHz to 18 GHz and flat to within ±.75 dB. That's a lot of noise output power, and if you connected the full unattenuated power of this noise head into a somewhat numb 10 GHz or less frequency receiver, it would jump and take notice. The reaction would be the same as putting 100 microvolts from a signal generator into a receiver that is sensitive to 5 microvolts that's an S-9+++ signal capable of turning any receiver upside down.

To really find out what is going on, we have to attenuate the noise head power to lesser and lesser levels of noise power and see what the receiver's reaction is, and then calculate the difference between the noise head's noise and no noise at the output of the receiver. The output of the IF amplifier or audio output is coupled to the noise figure meter to make this measurement. What is going on is that the NF meter is pulsing DC power at a 1 hertz on/off rate to the diode noise head. This produces a signal of noise pulses alternating between noise on and noise off. The detector circuit in the noise meter measures the difference between noise on and noise off to produce a reading in dB that is expressed as noise figure. In the noise off state, the ambient noise of the system is measured, and this base line value is compared to the noise on reading. This comparison expresses the true noise figure of the device or converter in dB. The lower the number the better the system amplifier. Adjustments to the amplifier can be made at this time to improve the noise figure readings.

Using a noise head with 25.5 ENR means that noise figure of better than 20 dB can be measured. By modern standards this is quite numb for systems up to 24 GHz. What is done to make lower readings of noise figure possible is to attenuate the noise head power to a lesser value in dB with a 10 or 20 dB attenuator. For a 10 dB attenuator 10 to 20 dB NF can be measured; this might be a starting point for first cut alignment. However, for serious measurements an attenuator of 20 dB is used to make a reading of less than a 10 dB NF. While the Sanders 5400B is an early surplus NF meter, it is not capable of stable sub-2 dB measurements. This is still not to scoff at, as it still

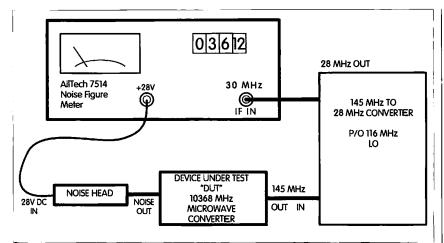


Fig. 2. Noise figure meter testing a microwave converter with 145 MHz IF output. Gain not required at 30 MHz, as converter has high level at 145 MHz IF output. Converter from 145 MHz–28 MHz uses RF mixer and 116 MHz LO crystal oscillator. The noise figure of the microwave converter is now being measured.

can provide meaningful measurements and reasonably good results.

The noise head used in this system is not cheap either, as a good noise head to 18 GHz can run from \$400 at used surplus dealers to \$1300 new. Keep your eyes open, as they

can be had at swap meets for \$1 after they are separated from their cables and meters. It seems that most external devices, probes and such, seem to migrate in surplus from the devices that they are used with, making them an orphan item possibly available in

unexpected places
— especially if you can spot a bargain.

While the Sanders NF meter is quite versatile, it accepts IF frequencies from 10 to 300 MHz - or video input from sources such as the speaker audio jack - to a real wideband video output source. While it is versatile in these applications, it falters in the sub-2 dB noise figure measurements. It's kind of like having a Ford or Chevy while wanting a Ferrari. Well, enter the next level: the Ailtech 7510 through 7514 NF meters. I was able to pick up an Ailtech 7514 meter and NF head that allows RF frequencies to be measured from 1 to 12.4 GHz, and NF

measurements to

sub-1 dB readings. Just what the doctor ordered.

This meter has one liability, as it has only an IF at 30 MHz as its input frequency. That means that a converter for your IF frequency must be constructed to interface to the NF meter. For all my microwave systems, I use a 2 meter IF for transmit and receive with all converters, so all I need is a 1960s converter for 2 meters to 28 MHz and we are in business. I haven't tried the setup yet, as I'm still gathering parts to put it all into play. Using 28 MHz for an IF should not be a problem, as the 30 MHz IF input is 5 MHz wide. That means that I can use the 2 meter converter in the junk box transistorized and near ready-to-go. I have to add a filter at the IF (30 MHz) and some gain to interface with the IF input circuits, but that can be as simple as a couple of MMIC amplifiers.

There is version -09 for the 7514 NF meter that offers selectable IF frequencies for a great variety, but 2 meters is not one of them. Just a simple mixer local oscillator at 116 MHz and IF preamplifier and filter for 30 MHz is all that is required. Nothing special, as the preamp or microwave converter to the 144 MHz frequency range is the main noise figure determining element in the noise figure measurement. The subsequent stages contribute to the overall NF reading but to a much lesser degree than the first stage device.

I am in the process of building and modifying the converter for the NF meter and will let you know how it goes. Right now I am collecting parts and putting together the full system for bench use. We will finish up this topic next month, with great expectations of having the full noise figure system in operation.

Well, that's it for this month. If there are any questions, drop me a note at my E-mail address. Best 73. Chuck WB6IGP.



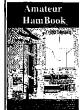
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Low Power Operation

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The Lure of QRP

Well, what did you get this year for Christmas? Another set of finals for the SB220? Well, it's a New Year and a new century and time to change your thinking. Have you ever tried QRP? Just about anyone can chase DX with a 100-watt microprocessor-controlled transceiver. Try it with only two watts! That's the challenge of QRP. There's nothing like working a rare DX station with one watt to sharpen your operating skill. Of course, there's much more to QRP than DXing with low power.

RP is more a state of mind than some thing you can touch with your fingers. QRP is relative, too. It all depends on how you look at things if you're running QRP or not. Basically, QRP is one of the many "Q" signals. QRP means to reduce your power. You could tell the other station to QRP just as you would say QRS to the same station.

Since QRP really means only to reduce power, you would be correct if you switched from running the SB220 to the 100 watts from the transceiver. And, you could say with a straight face, you're now QRP! So, if you're working a pileup and the DX operator only wants QRP operators to call. Shutting down the SB220 would give you the QRP edge. And once again, you're QRP!

Let's look at this one more time. Let's say you're working the CQ World Wide DX contest, and you're running a kW. By turning the amplifier off, thus dropping your power down to 100 watts - you're now QRP! In fact, let's take this one more step. Suppose the DX station you're listening to says, "QRP only please." Snap! Off goes the amplifier. You're now QRP and you make your contact with 100 watts. That's far from operating with low power. But based on the fact you were running 1000 watts, reducing to 100 watts does in fact make you a QRP station at the time you called!

But, that's not really what QRP means to most hams. In a nutshell, if you say, "I am running QRP," you are sending no more than five watts of RF out to the antenna. Most commercial and kit-based QRP transceivers and transmitters produce two to three watts of RF output. Notice that the power is output and not input. No one really messes with input power; it's what's going out to the antenna that counts.

Most hams have adopted it to identify low power equipment or operation. The Club International (QRP ARCI) has formally adopted the power level of five (5) watts as QRP. This is measured as output power from the transmitter. For really low, low power work, the term "milliwatting" has replaced the aged term of QRPp.

QRP is a great place to make new friends. QRP is a subculture within ham radio. Usually, when I tell someone I'm running QRP, the QSO changes from the usual "rig here is Kenwood and the weather here is warm" to a real conversation with an interested human operator on the other end.

Building your own gear

I've always enjoyed building my own equipment. In fact, that is one of the reasons why I got my ham ticket in the first place. I just happen to like the smell of molten solder! I would dare to guess that most of the operators who enjoy QRP also enjoy building their own rigs. Nothing in the world can beat the feeling of working a station using home-brewed equipment. A QSO with gear you constructed with your own hands will be burnt into your memory for life. The warm fuzzy feeling will last for days after the QSO is over. That's a feeling you don't get when operating the newest



Photo A. If you like building kits, you will love QRP. Here, a Ten-Tec QRP transceiver kit is laid out and ready for assembly. The little gem has approximately 200 parts, and thus requires around 15 hours for assembly and checkout. Then it is ready to work the world! Now, who could resist such an attractive challenge?! (Photo courtesy of K4TWJ)

microprocessor-controlled Japanese-made SSB transceiver.

You don't need to be a rocket scientist or an electronics engineer either to build your own rig. In fact, QRP projects are especially suited for the neophyte in home-brew construction. Building a transmitter is relatively easy. Usually, there's a wide tolerance range for parts, and most transmitters are built around straightforward circuits. Sometimes the transmitter is nothing more than a one-transistor oscillator coupled to an antenna. Only a handful of parts are required to produce two watts on most frequencies. You'll be astonished by the amount of DX you can work with just a spoonful of parts.

Because most QRP projects are simple, you usually won't have trouble finding parts for the rig. A well-stocked Radio Shack can supply you with all the parts required for a 75 meter CW transceiver. Companies like Mouser Electronics [958 N. Main, Mansfield TX 76063: telephone (800) 346-6873] and Digi-Kcy are especially geared to filling small orders. Several hams have started their own companies supplying small parts just to the homebuilder and the QRPer.

You don't like hunting parts to build rigs? Several different companies furnish readyto-go kits, too. Kits range from the very simple "oner" by the G-QRP club to the ARK-40 from S & S Engineering, the K2 by Electrocraft, and the "1300 series" from Ten-Tec (**Photo A**).

I've never liked working on microcircuits, but for some, the challenge of QRP comes

in the form of assembling a transmitter in the smallest possible chassis. I've seen rigs built in pill bottles, Band-Aid boxes, a matchbox or two, and even a Sucrets box.

Most construction projects center on building QRP transmitters. There's nothing stopping you from rolling your own receiver either. The popular direct conversion receiver makes a perfect marriage for a QRP transmitter. A direct conversion receiver is sensitive, as well as easy to build. Or you can go with several of the simpler superhet designs offered in 73 or QST. Many of these simpler designs rival the performance of much more complex receivers.

QRP and other frequencies

Alas, QRP is not only for HF use. Special QRP days have been set aside for the OSCAR satellites. Running too much RF on the uplink may damage or shorten the life of the satellite's battery.

Then there's meteor scatter and mountaintopping using low power. It's possible to work numerous states under favorable conditions using 100 mW of RF on 10 GHz. With the newer multiband rigs on the market, you'll be seeing lots of activity on two and six meters SSB and CW. QRP is very much alive on frequencies above 30 MHz. QRP is also alive on the digital modes as well. I've used AMTOR, RTTY, and packet all while running five watts or less. It's amazing how AMTOR can keep a link up and running while squirting only five watts to the antenna.

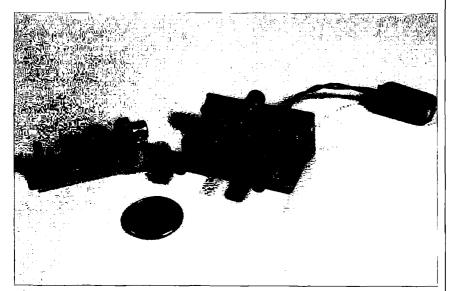


Photo B. QRP: A home-brewer's haven! Shown here are a couple of weekend projects everyone likes: a Micronaut transmitter available in kit form from K4TWJ (left), and a Micronaut receiver available as a PC board from FAR Circuits (right). Each item can be assembled in a couple of hours, and reflects the "fun of home-brewing" side of QRP.

QRPing and emergency communications go hand in hand

During a natural disaster, your QRP transceiver may be the only source of communications from the disaster area. During electrical outages, running your ham gear QRP-style takes on a whole new meaning. Running low power is always better than running no power!

Because QRP equipment is normally much smaller in size, its power requirements are easily met with small batteries. A QRP transceiver is ideal for taking ham radio with you. You can easily carry a complete HF rig, with batteries, in a backpack. Hiking, camping, or even whitewater rafting takes on a whole new meaning now that ham radio is aboard. There's also the possibility ham radio may be vital in saving a life or two while you're out camping.

Battery power is all you need for worldwide communications from your home, too. In fact, most QRPers enjoy operating their gear from batteries. Solar power and QRP operation go hand-in-hand to supply all the energy requirements of even the busiest ham.

Getting started in QRP operation

QRP is not always push-button operating! If you're used to making a contact on one call, then an adjustment in thinking may be in order. Anyone can work station after station, many times over, using less than perfect antenna systems with 100 watts. That's not always the case with QRP. Be prepared for some missed calls. You'll also find that the other guy will cut the QSO short once you announce that you're running QRP. I feel personally responsible for making a lot of hams overweight when running QRP. I say I'm QRP and they say, "Have to run to eat now, 73." I guess they are afraid of telling me I am 599 + on their end!

Working All States (WAS) with QRPSSB is a real challenge! But, then again, many, many times, I've been 599 with 1 watt to the antenna. That's part of the thrill of QRP—you never know what will happen.

Running QRP

All you need to try QRP is a transceiver. The only thing you need to know is how you lower your transmit power! Now, don't reduce the power to five watts at once. Drop your power down to half of what you've normally used in the past.

Don't feel like jumping right into the fold of QRP at once? Then get together with

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New Multimode Shareware — RCKRtty

You may be relieved to know you fairly well escaped an exercise in dull reporting. This month, I was determined to visit all the Web sites in "The Chart" and note changes of interest as well as recheck the validity of the addresses. In the midst of this task, something new arrived in the shack.

I had recently checked my E-mail and there, from the PSK31 reflector, was a message about something new to me. It concerned a program written by Walter DL4RCK, named RCKRtty. Anything with RTTY in the name demands immediate attention, so I inserted the address shown in *The Chart* in my browser.

There were some pleasant surprises. I find there are hams looking for a Windows-based program for their MFJ 1278, and here is one to answer the need. There is considerable explanation of the many features of the program. It handles RTTY, PACTOR, AMTOR, PSK31 (in controllers made for the mode), and CW. It performs these magic feats with

TNCs by SCS, AEA, KAM, MFJ, and DSPCOM.

The cost is reasonable. The program

The cost is reasonable. The program comes in several flavors, but the basic program sells for about \$30. There is a contest version that costs extra. Importantly, I was able to download a copy for evaluation. It is good for 50 sessions, and then the transmit mode is supposed to shut down. In general, the evaluation version is not really crippled for operation in any mode.

Naturally, I downloaded it along with the Word 97 version of the manual. The manual proved to be valuable, even though it didn't come up properly in my Word 6 software. Some do, some don't. It was still readable and is not the same file as the help file in the program. Not fully formatted, the manual is about 60 pages. It would expand a bit if I made it look nice.

Between the manual and the extensive help files, the program was slick and easy to get up and talking to the PK 232MBX. For some programs, that is quite a hurdle. I watched the indicators on the front of the 232, and they responded correctly as I changed from RTTY to PACTOR and CW, so it looked like it was going to be a snap.

With the radio playing a PACTOR tune, I put the program in PACTOR Listen mode and it started parading characters across the monitor just like it was supposed to. This was going entirely too easily. Next came a learning session, as I attempted a connect in PACTOR. I couldn't readily find the box to insert the other station's call. I did soon find, however, that the program would signal the 232 to put the transmitter on the air even if I wasn't ready. Another good sign, but I had to find the cure for lack of a callsign. Later, it became obvious where that callsign belongs. (See Fig. 1.)

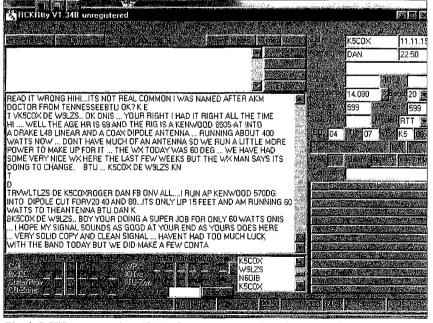


Fig. 1. RCKRtty screenshot. This is the program "reading the mail" of a RTTY QSO. The blank upper space is for composing the transmit message. It functions about like any other Windows program, with a few unique features. The upper right box has the callsign of the "other" station, which it captures after the "de" in the callsign exchange. Note the box at the bottom with the four callsigns captured the same way. Also, the name in the upper right box was grabbed from the received text! The first box is the necessary one to have a call in for a connect on PACTOR. Also, the Auto-CQ and Connect commands work only when the correct set of F-keys are activated. There is more, and it is fascinating. See the text and take a look for yourself. This is one of the few Windows programs for MFJ (along with the "standards" such as AEA, KAM, and SCS).

It was getting late in the day and signals were waning, so I tried something else. I gave a listen on RTTY, found the button to reverse the tones, and found good copy in that mode. Since RTTY is a little less fussy about entering the callsign. I thought I would simply try a CQ.

More learning. The CQ is automated and wouldn't be much problem, except I had somehow lost my call from where I had entered it in the program during setup. After reentering the call, it was necessary to reboot the program so the call would stay. Back to the automated CQ. One of the secrets is to have the programmable function keys activated. Among those functions lies the automated CO.

First QSO

While I was fiddling with this, and it was getting darker outside with the consequent weakening of signal strength, I had gotten to the point that a clumsy CQ was coming forth, albeit in reverse format. And ... it was answered! Magic!

The calling station AAØFT explained that my signal was "upside down." (Again.) It seems that is the default on start-up. I can live with that. I had just discovered the fact at the time George explained it to me.

As you would expect, I told him about this newfound software I was trying out on him. George had not heard of it either, but he had an old MFJ 1278 kicking around that needed software. Could I tell him where I found this magic package? By then, the copy was really garbling. I know that rhymes with warbling, but it is not the same.

George gave me his E-mail address. I had him repeat it until I was sure I had it straight, and sent him the information at hand via E-mail. It is strange how I come upon these coincidental circumstances so often when I get on the air. In this case, I had just

Source for: Web address (URL): Pasokon SSTV programs & hardware www.ultranet.com/~sstv/lite.html PSK31 — Free — orig. PSK31 http://aintel.bi.ehu.es/psk31.html also Logger Site with links to PSK31 and Logger www.mysite.com/k5fg PSKGNR — Front end for PSK31 www.al-williams.com/wd5gnr/pskgnr.htm TAPR — Lots of info www.tapr.org http://freeweb.pdq.net/medcalf/ztx/ TNC to radio wiring help ChromaPIX and ChromaSound DSP www.siliconpixels.com software Timewave DSP & AEA products www.timewave.com Auto tuner and other kits www.ldgelectronics.com XPWare — TNC software with www.goodnet.com/~gjohnson/ sample DL RCKRtty Windows program with free http://home.t-online.de/home/d14rck/ HF serial modern plans & RTTY http://home.att.net/~k7szV software SV2AGW free Win95 programs www.forthnet.gr/sv2agw/ Source for BayPac BP-2M www.tigertronics.com/ BayCom - German site www.baycom.de/ BayCom 1.5 and Manual.zip in www.cs.wvu.edu/~acm/gopher/Software/baycom/ English N1RCT site - excellent RTTY ref. http://www.megalink.net/~n1rct/ Int'l Visual Communication Assn. www.mindspring.com/~sstv/ nonprofit org. dedicated to SSTV Creative Services Software www.cssincorp.com

Table 1. The infamous chart. Almost everything ...

happened on a piece of software and the lirst QSO turns out to be someone who has a need for just that package.

A new URL added

There came another revealing experience when George answered my E-mail message. He had already found the site by using the NIRCT Web site. So I took a look. This has references and links to just about everything I can recall seeing, plus a few new ones. It is not strictly a RTTY site as the name implies. You will find information and programs for almost every digital mode, and many sound card applications that are well worth a look-see. The URL is now listed in **Table 1**.

Back to the project

Every now and then a piece of E-mail shows up on my doorstep and I send off an answer without further thought. Specifically, readers want verification on a Web site URL. In those cases, I simply call up the Web site in question and copy and paste the correct address in the E-mail reply with whatever explanation is relevant.

There was nothing wrong with that, until I realized it was time to look down the list of references in **Table 1** that regularly accompanies this column. I wouldn't have considered this if I had not been reading a recent article by Terry Mayhan K7SZL in *QST* (Oct., Nov.) about his latest development, a PACTOR interface that works with PACTOR freeware developed by Tom Sailer.

At that time, I realized that Tom had changed his Web site address. Not too bad a problem as yet. I accessed the old URL address and found a forwarding link to the new address, so the chart wasn't yet telling a lie.

Then it came to me that I wasn't really keeping you, my readers, abreast of the latest happenings. Plus, I wanted to confirm that the original information was still intact on the Web site, which concerns an inexpensive serial modem that allows the use of the HamComm shareware for RTTY. It is still there on the revamped and expanded Web site.

Radio sounds

Plus, Terry has added so much useful information for those wishing to get started in digital hamming on a budget. If you have ever wondered what RTTY, PACTOR, SSTV, or PSK31 sound like, he has wave files of the sounds as you will hear them over the air. When you tune around 14.065—

14.090, you hear RTTY, PACTOR, and PSK31 — all next to each other, which can be confusing until you get a handle on the sounds of each mode.

1 have no real reason to build the PACTOR interface, as I already have the mode available with the PK-232MBX. The thought did cross my mind that it would make another nice portable gadget that I could point to as a do-it-yourself

I am still using the original serial modem for RTTY and SSTV that I made from the K7SZL circuitry a year or so ago. Anyway, Terry has made a way for you to get on PACTOR for quite a bit less than a hundred dollar bill. Well worth the look.

Proceeding on to verify other Web site addresses, I stopped by the XPWare URL and found everything pretty much the way I had last remembered. Since I do have a working copy of the program for my AEA PK-232MBX, I checked for upgrades. There are at least a page of changes to the program, with only a few minor changes that apply to my particular usage. Good to know Gary keeps on top of his product, must be time to update.

Another program for MFJ

Since there have been inquiries about software for the MFJ 1278, the Web site reminded me that a DOS program is posted and an evaluation copy available for download. This may be what some of you are looking for.

A look at the TigerTronics page is informative. They still have the original packet and multimode modems in vest-pocket sizes that they build and market under agreement with BayCom. They also have the BayCom version 1.6 software which is a commercial copy of the excellent software developed for packet. The price is \$20, and I am sure it works well. I have used the v. 1.4, and it is the program I have come back to when I couldn't get some of the other programs to operate the BayCom modem or its clones.

You will find they have branched out a bit. They are building and marketing an APRS system that sounds very good. It appears to have all the bells and whistles, and you can pick the combination to fit your needs and pocketbook. The original shareware they used to have on the Web site for the multimode modem is no longer available

there. I would imagine the help-line calls for items for which they received no revenue played a determining factor in that deletion. However, the overall look of the Web site shows that they have surveyed the needs of the ham community and are working to fill those needs.

In keeping with that thought, Tiger-Tronics has also introduced a line of early warning weather receiving and transmitting equipment and software. This line comes in varying costs and abilities.

Other BavCom freeware

I checked the URL in Table 1 to see that the Bay-Com v. 1.5 software was still available. It | 73, Jack KB7NO.

is. Short story on that: I downloaded it once upon a time and never used it. The 1.4 works well but I couldn't find a site where that freeware version was still available. After a long search, this site came up, so there is a freeware version of the BayCom software still available.

Speaking of the small packet modems, I still have the LDG Electronics clone of the BayCom 1200b packet modem. LDG discontinued that one, but they have other ham equipment of interest. I am using one of the AT-11 tuners, and it does a bang-up job as a mobile application. Looking a little further on the Web site, I found that they are now handling a line of mobile antennas at a very competitive price. And there are other items worth a visit to take a look at, too.

Another PTT circuit for sound card programs

I thought I knew all there was to see on the Silicon Pixels site, but I took a look anyway. They still have the excellent sound card programs for SSTV and DSP, but as I looked, I saw a link to a site with a PTT circuit you can build yourself. It is not a lot unlike the Lectrokit PSKI reviewed in the August issue of 73 magazine.

After thinking about it for a bit, I realized why the ChromaPIX authors had searched out a source for the PTT system. They had published circuitry to cause the automatic PTT, but lacked detailed documentation. This circuit is well documented, and does everything needed for use of their sound board programs as well as for PSK31.

When I followed the link for the PTT circuitry to [http://teleline.terra.es/personal/ esteban 1/], I found it was primarily in Spanish. That can be a little scary for those of us who are language-challenged. However, the information you want is available in very well written English, with US sources for parts and listed part numbers.

I hadn't looked in on the Pasokon SSTV site for a while. I found that it has been redone not only with some good information on the program, but also with some good motivating material to get you going on SSTV. And the stress is on economy. John Langston has several nice programs and all the information to get you started.

I thought, as I was looking at John's Web site, how the ham sites all have links that usually include each other so that you can get the whole picture about what you are getting into. It all fits together. A great hobby.

If you have questions or comments about this column, please E-mail me at [jheller@sierra net]. I will gladly share what I know or find a resource for you. For now,



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Radio Direction Finding

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Foxhunting at Hamcon-99 — and More

The ideal contest for a convention or hamfest is a hidden transmitter hunt (often called a foxhunt). When properly presented, it combines intrigue, education, and good exercise. If the budget permits, there can be valuable prizes, too. More and more convention organizers are following the example of the ARRL Southwestern Division, which has had a radio direction finding (RDF) contest at its annual convention (Hamcon) almost every year for decades.

What attracts hams to conventions and hamfests? Seeing new equipment? Buying and selling at the flea market? Interesting speakers? Yes, all of the above, and more. The food? Nothing great at Dayton, but the Santa Barbara Hamfest tri-tip beef is always a treat.

What about friendly competitions? I remember the great QLF Contests of years past, where everyone howled with laughter as ordinarily highly proficient CW experts

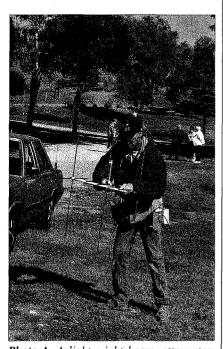


Photo A. A lightweight beam, attenuator, and handie-talkie or scanner makes a simple and inexpensive on-foot RDF setup. This dual-band yagi gets bearings on both the two meter fundamental and the third harmonic.

tried sending code with their left feet. One local summer 'fest in my area still has a Transformer Toss. Would-be Schwarzeneggers see how far they can heave an old copper-and-iron monster, swinging it by its wires.

Who needs cars?

A real winner, though, is a foxhunt. But if satisfying everyone is the goal, a convention's Foxhunt Chairperson faces a dilemma. The hunt has to be hard enough to give a challenge to experienced RDFers, yet simple enough that no one goes away empty-handed, even first-timers. It has to be suitable for the capabilities of young and old, whether physically fit or physically challenged.

All-on-foot hunts are growing in popularity over mobile hunts among hamfest sponsors, for several reasons. All ages can take part, as no driving is required. Everyone stays close by the hamfest site instead of ending up dozens of miles away. Families and friends can watch and cheer. A simple RDF setup such as a small beam, active attenuator, and handie-talkie gives excellent performance (**Photo A**). Hams who fly to the 'fest can hunt without having to outfit a rental car.

Another reason for having on-foot foxhunts at hamfests is to encourage hams (and prospective hams) to learn about international-style foxhunting, sometimes called radio-orienteering or ARDF. Perhaps there is a future ARDF champion waiting to be discovered. With that in mind, the Fullerton Radio Club was eager to take responsibility for the foxhunt at the 1999 ARRL Southwestern Division convention on the first weekend of October. The task of hiding the foxes fell to me.

The best venue for an on-foot foxhunt near the *Queen Mary* (Hamcon-99 location) is Angel's Gate Park in San Pedro. This 130-acre site, formerly Fort MacArthur, includes everything from well-groomed picnic areas to desolate patches of barren ground. Elevation ranges from 120 feet above sea level near the coast to 300 feet at the Marine Exchange. It's the site of United Radio Amateur Club's Field Days, so it wasn't difficult for Jim WA6MZV and Bev WA6TIU Pitman of URAC to get a permit for us to use it.

From 1888 to 1982, this land was full of fortifications and munitions for defense of the vital deep-water harbor of Los Angeles. Its giant mortars and artillery could lob 1500-pound shells 14 miles out to sea during the First World War. Radar and command centers for Nike missiles were housed there for 20 years following the Korean War. All the guns and electronics are gone now, and the extensive network of underground tunnels has mostly collapsed. But many of the gun mounts and ammunition storage bunkers remain. There are countless nooks and crannies, ideal for placing hidden transmitters (**Photo B**).

Fort MacArthur, named after a Civil War Medal of Honor winner who also was a commanding general in the Spanish-American War, is now in the National Register of Historic Places. Portions of the bunkers are now a museum, open to the public on weekends. Mike Taylor of the museum staff was eager to host our foxhunt.

Mike had some clever hiding places to suggest. For instance, one fox ended up in a pile of surplus ammunition cases for sale outside the museum store. Hams are used to foxboxes built into ammo cans, but finding

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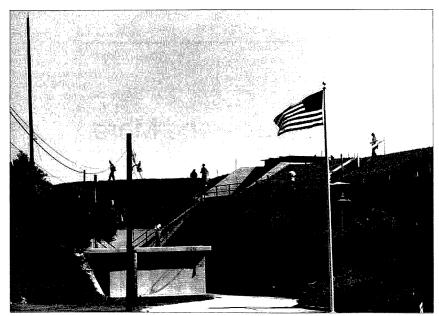


Photo B. Foxhunters swarmed over Battery Farley-Osgood at old Fort MacArthur. Microtransmitters were out of sight in metalwork atop Battery Farley and in a display of ammunition cans in front of the museum at ground level.



Photo C. The museum volunteer in the back seat is actually sitting on a hidden transmitter. No hunters found it.

HOMING IN continued from page 53

this one was like looking for one particular egg inside a henhouse.

I had some other ideas for dastardly hiding locations near the museum, and Mike readily obliged. For instance, we put a foxbox out of sight under the back seat of an old jeep that the museum volunteers were driving around the grounds (**Photo C**). An

ammo can was already mounted in plain sight between the jeep's front seats (a poor man's glove box), but the T wasn't in there!

Perhaps the sneakiest museum fox was a micro-transmitter in the rucksack on one of the young Army "soldiers" (**Photo D**). Only three sharp-eyed foxhunters noticed the antenna wire sticking a couple of inches out of his pack.

From a hider's standpoint, one of the biggest attractions of the park is Batteries John

Barlow and Saxon. Their immense concrete fortifications and rooms are in a two-acre pit, accessible by steep staircases. I had several great fox spots there all picked out. Then, a week before the hunt, a production company moved in to make a movie. Its security force wouldn't let anyone approach the pit, even with a permit, so we had to declare that area off limits. Fortunately, no filming was taking place on hunt day, or we might have had to stay out of the entire north section of the park because of their noise concerns.

Livin' la vida ROCA

There is no perfect time period for a convention foxhunt. Our Hamcon is primarily a two-day event, Saturday and Sunday. Having the hunt on Saturday would eliminate the opportunity to have a day to promote the event. There are too many other competing activities on Saturday, anyway. That's why Hamcon foxhunts are traditionally on Sunday afternoon, right after the grand prize drawing. There are always a few no-shows, as people change their plans overnight and some out-of-towners decide to head for home early.

All day Saturday, members of Fullerton Radio Club staffed the sign-up table and explained the basics of foxhunting to interested visitors. The Foxhunt Forum at 10 a.m. drew a good crowd. After reviewing the sign-ups Saturday evening, we decided to divide the individual competitors into three divisions: Juniors (age 18 and under), Prime (ages 19 to 49), and Masters (age 50 and up). There was also a separate team division for newcomers who felt unprepared for solo hunting, and to accommodate the handicapped (**Photo E**). Only two persons could be on a team. A team could carry only one RDF set.

Worldwide standard radio-orienteering rules, as prescribed by the International Amateur Radio Union (IARU), aren't suitable for casual hamfest hunts. IARU requires five transmitters in a very large forest, all on the same frequency and on-air in rotating sequence for one minute each at a time. The transmitters must be stationary, with a prominent orienteering flag nearby. Contestants are started at intervals and timed individually.

For walking/running hamfest hunts, it's better to have more transmitters, more frequencies, more frequent transmissions, and more outrageous fox locations. This is similar to an event called the "ARDF Technical Session" in Asia. Some hams in the USA call it "Radio-Orienteering in a Compact Area" (ROCA). "Homing In" for February

1999 has the story of a 6-fox ROCA in the San Francisco Bay Area and "Homing In" for September 1999 details the 16-fox event at the 1999 Dayton Hamvention.

In a ROCA, the emphasis is on RDF skill, not athletic ability. You win by finding the most transmitters within a fixed time period. An hour and a half is about right. It's long enough to maximize the foxhunting fun, without being so long as to be beyond some hunters' endurances. Everyone starts at the same time.

Each Hamcon-99 foxbox or antenna had a tag, about half the size of a stamp, with a unique 3-digit control number. Sometimes — the rucksack fox for example — the tag was the only part of the fox that was visible. Before the starting horn sounded, each competitor was given a slip of paper on which to write the control numbers as they were found. The paper had a list of all foxes, a description of their sounds, and their frequencies. To get credit, the correct control number had to be written on the correct transmitter line.

I was concerned that most hunters would simply start at the top of the list and go after the first fox they could hear, resulting in a pack of hunters playing "follow the leader." To spread them out, I made several versions of the frequency slip, each with foxes listed in different order.

A ROCA record

My goal was to have 21 radio foxes on the air at start time. Clarke Harris WB6ADC and Mike Obermeier KD6SNE loaned a total of four, and the rest were mine. One was dead-on-arrival at the park and a couple of others didn't last for the full hunt time, but the remaining 18 were more than enough to challenge the 21 hunters from all over southern California. Eleven hunted as individuals, while the rest chose to be in the two-person Team Division.

Six foxes were on or within 10 kHz of the southern California coordinated T-hunt frequency (146.565 MHz). Hunters didn't know it, but they were all physically close too, within about a 900-foot-diameter circle near the start/finish area in front of the museum. Since half of these six transmitted continuously and the rest intermittently, the QRM should have made them the hardest to identify and track down. Nevertheless, most hunters spent much of the hunt period on these six foxes. All but three hunters found at least one of them.

The rest of the transmitters were each on separate frequencies throughout the twometer band. That made RDFing for them easier, but there was plenty of legwork

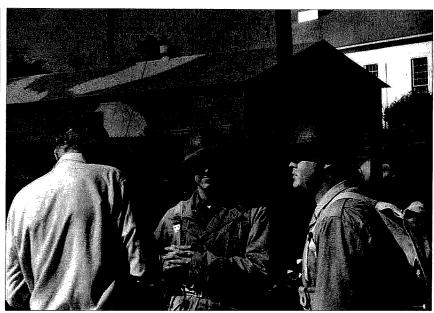


Photo D. A micro-T was in this rucksack of the "soldier" in the center. Only three hunters identified it. Clarke Harris WB6ADC at left is suspicious.

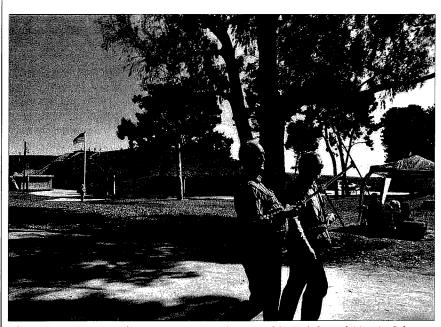


Photo E. Working together, Dennis Schwendtner WB6OBB (left) and Marvin Johnston KE6HTS found the most foxes. Despite his blindness, WB6OBB has been foxhunting for two decades.

needed to get there. Those foxboxes were widely scattered throughout the park, including the southwest, southeast, and northeast corner areas.

Just to make it more interesting, there were some decoy (nontransmitting) devices and tags out there. WB6ADC's toy soldier radio/phone with flashing LED and antenna tag got lots of attention as it lay in a guard shack. One competitor decided that it was transmitting on 146.565 MHz. But as the

others figured out, its only emissions were on lightwave frequencies. Many folks carefully examined the ammunition can with antenna next to a vintage artillery gun on display, but it didn't fool anyone for long.

In IARU-rules hunts, a good topographical map is a necessity, to plan an efficient 5-fox route and avoid getting lost in the woods. Since Angel's Gate Park is fairly open land, a map isn't needed. But I made one up and handed it out anyway. Most hunters ignored

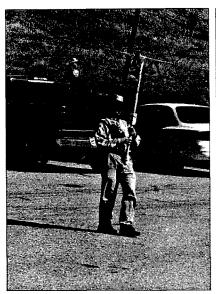


Photo F. This commercial quad provides great sensitivity and directivity, but I'll bet it got heavier and heavier as the hunt went on

Photo G. To get credit for one of the foxes, you had to identify which of the 11 antennas on my van was radiating. This hunter is working on the problem with a miniature RF "sniffer."

it and took off after the foxes they could hear. But a few used it to practice for upcoming formal ARDF events, marking their bearings carefully and planning strategy. The map was certainly useful to me, as my secret marked copy made it much easier to round up all the foxboxes after the hunt was over!

I don't think any two of the hunters' RDF setups were alike. A few were large and

heavy (Photo F). Some beginners used only their handhelds and the body-shielding technique to get directivity. Quite a few carried the beam/attenuator/HT setup mentioned above.

The micro-T atop Battery Farley-Osgood with "Ringing Phone" audio was the one found by the most competitors (eleven). Two of the transmitters were underground. One was buried under vegetation on a slope. The other dangled by a chain from a grate covering one of the fort's water storage cisterns. Each of them was found by only one hunter.

Nobody wrote down the right

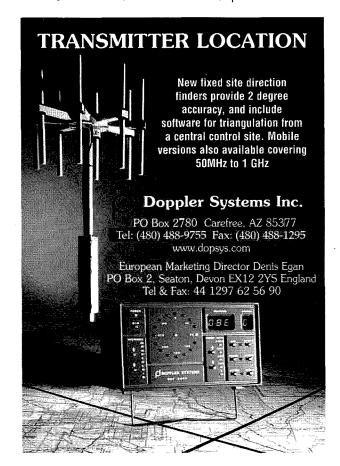
control number for the transmitter in my van. There were tags on all eleven of the van's antennas, so the choice wasn't easy for those without good "sniffing" gear (**Photo G**).

Hamcon's budget was tight this year, so the usual big cash prizes were not available. Fortunately, our club was able to obtain plenty of inexpensive merchandise donations for the prize raffle. Every individual and team received one raffle ticket for each correct control number on their slips. In addition, first place in each division received a small cash prize.

Everybody who stayed for the entire hunt found at least one of the transmitters. Nobody was shut out. I think that everyone went home with at least one prize from the raffle table.

The main goal for Hamcon/Foxhunt-99 was for it to challenge the experts while encouraging the beginners. From the participant feedback after the raffle, it was evident that we succeeded. Several first-timers later sent E-mails thanking the club for hosting this event.

Does this inspire you to include foxhunting at your own club's next convention or outdoor event? The cold weather months are an ideal time to build up some foxboxes and RDF gear, so let's get going. Visit the "Homing In" Web site for information on the basics of foxhunting and fox hiding. I want to hear how the sport is taking hold in your area, so please send your hunt reports and stories to my E-mail or postal address.



Amateur Radio Via Satellites

Andy MacAllister W5ACM 14714 Knights Way Drive Houston TX 77083-5640

You Can Make Hamsat Contacts Now

Using the resources of our amateur radio satellites can be one of the most enjoyable and exciting ham radio activities you may ever experience. Do you remember your first ham radio contact? Your first "via hamsat" can be just as exhilarating! Many hams who have sampled typical ham activities like VHF-FM repeaters, shortwave communications, packet, amateur television, etc., have found satellite chasing as a new, high-tech medium in which to pursue their favorite modes.

Then OSCAR-1 (Orbiting Satellite Carrying Amateur Radio) was launched in 1961, very few hams had the gear to listen for its two-meter CW downlink. Later, when hamsats were designed to be crossband linear repeaters in the sky, the gear to work them was still a bit exotic. Multimode VHF and UHF transceivers were expensive. Since then, the radios necessary for satellite operations have become common and some of the satellites have been designed to be easier to work.

It is possible to make contacts via satellite with a decent dual-band, FM handietalkie. It's been done thousands of times. The most popular satellite for newcomers, or those with FM-only VHF/UHF stations, is AMRAD-OSCAR-27. AMRAD stands for the Amateur Radio Research and Development Corporation, a technology-oriented ham radio club located in the Virginia suburbs around Washington DC. A-O-27 is also known as the commercial satellite EYESAT-1. Confused? This microsat-based satellite was actually built by the Interferometrics Corporation of Chantilly, Virginia. The original purpose of the satellite was to provide a demonstration platform for commercial store-and-forward digital communications. The ham radio portion of the spacecraft from AMRAD is an integral part of this versatile system, and has become enormously popular.

An easy sat for communications: A-O-27

AMRAD-OSCAR-27 is a single-channel, FM crossband repeater. Although it was not built by AMSAT (The Radio Amateur Satellite Corporation), it is based directly on the microsat spaceframe that was developed years before for AMSAT-OSCAR-16 and others. A-O-27 circles the world in a circular orbit at 800 kilometers once every 100.8 minutes. The satellite is a 22-pound cube

just over 8 inches on a side. It was launched on September 25, 1993, from Kourou, French Guiana, on an Ariane 4 rocket (mission V59), as part of the ASAP (Ariane Structure for Auxiliary Payloads). Other passengers on this flight included the main payload, SPOT-3, and other small ASAP satellites including HealthSat-2, PoSAT-1, KITSAT-2, and ITAMSAT.

Finding A-O-27

Knowing when and where to find A-O-27 is the main challenge that stops many amateurs from initially trying (and using!) OSCAR satellites. The popular solution is using a home computer for the tracking process.

To convince your computer to track satellites, you will need software. You can find many varieties on the Internet. You won't even have to search or go far. There are many freeware and shareware programs



Photo A. Chuck Duey KIØAG at a ham convention in Austin, Texas, not only listens to A-O-27, but makes several voice contacts using only portable equipment.

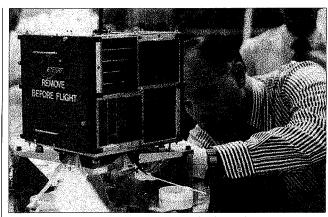


Photo B. AMRAD-OSCAR-27, a.k.a. EYESAT-1, just before launch in 1993. (AMSAT-UK photo)



Photo C. A-O-27 was one of five small satellites on the Ariane ASAP (Ariane Structure for Auxiliary Payloads) that went to orbit with SPOT-3.

available from AMSAT. Just go to the URL (Universal Resource Locator) [http://www.amsat.org]. They have MS-DOS.



Photo D. A-O-27 was launched by an Ariane 4 rocket from Kourou, French Guiana, on September 26, 1993.



Photo E. A-O-27 was designed for a 5-6 year lifetime. We're into the seventh year and going strong.

Windows, Linux, Macintosh, Psion, HP-48, and even TRS-80 Model 100 satellite tracking programs. Your new satellite-tracking software will require current orbital data to provide accurate results. AMSAT's Web site has that, too. Follow the instructions with the software, and you'll be tracking in no time.

After you have the software properly running, you will discover that A-O-27 is above your horizon four to six times a day between the local hours of 8 a.m. and noon, and 8 p.m. and midnight. There are two to three morning passes and two to three evening passes. This is because A-O-27 is in a "sun synchronous" orbit. It comes by about the same time every day due to the characteristics of the orbit. The satellite is only ON for the morning passes. The A-O-27 groundcontrol stations set the satellite to be active for specific periods of time only when it is illuminated and the batteries are charging. Good power management may be part of the reason A-O-27 is doing so well after many active years in space.

Working A-O-27

The FM uplink frequency is 145.850 MHz. The FM downlink is on 436.797 MHz. Unlike a typical terrestrial repeater, the apparent frequencies change during the course of a pass. This is caused by Doppler shift. When the satellite is approaching you, the downlink will appear to be as much as 9 kHz high. When the satellite is at its closest point, with respect to you, the signal will be centered on 436.797 MHz. As the satellite travels away, the apparent frequency can be as much as 9 kHz low. Most FM-only

UHF transceivers, HTs, and scanners won't tune in 1-kHz increments. This isn't a problem, since the signal is FM, and a few kHz won't hamper the intelligibility of the signal. Before a pass begins, set the radio or scanner to 436.805 MHz. During the pass, tune down in 5-kHz increments to get the best reception.

The effect on the two-meter uplink is only one-third as much. For most operations, adjusting the uplink frequency is not necessary. Just set the two-meter transmit frequency to 145.850 MHz and leave it. The satellite's receiver is sufficiently broad to accept uplinks that are 2 to 3 kHz off.

If you are using a simple whip antenna on a dual-band HT, you can hear A-O-27 best by moving the antenna around for optimum reception. This is always true for a beam, and helps with any antenna due to the constantly changing orientation of the satellite with respect to ground stations.

When received signals sound respectable, the HT antenna will also be optimized for your uplink. If you get into the satellite's receiver, you will be able to hear the downlink at the same time. This can cause feedback if you have a full-duplex radio (capable of receiving on one band while transmitting on the other) and are not using an earphone.

Avoid this! If you can't get into the satellite, you don't have enough power, or you are trying to get in during an active weekend, or both. First-timers have their best results on quiet weekday passes. Most A-O-27 operators want newcomers to succeed. It means more folks to talk to and more grid squares to collect.

Most successful handie-talkie stations

have five watts for the two-meter uplink and a small dual-band beam, but, with some skill and practice, a number of excellent contacts have been achieved with only whip antennas, too. Start listening and experimenting now, and make sure you know your grid square. It's become a standard part of the exchange.

Finding out more about A-O-27

In addition to the information and links available from AMSAT's Web site, there are some really good books and publications for hamsat enthusiasts. My favorite reference is the 370-page The Radio Amateur's Satellite Handbook by Marty Davidoff K2UBC. It's published by the American Radio Relay League for \$22. An inexpensive publication from AMSAT, How to Use the Amateur Radio Satellites gives a snapshot of the characteristics and operation of every currently available hamsat. Both publications (and many others) are available from AMSAT at (301) 589-6062. AMSAT also publishes a bi-monthly publication, The AMSAT Journal, for AMSAT members. If you have questions about AMSAT membership or publications, call the number above or send E-mail to [martha@amsat.org]. I'll see you on A-O-27!

LETTERS

continued from page 6

that the FCC has never had, does not now have, and never will have any loan programs. But I asked the question anyway, and here is the answer from Danny Rittenberry: "Thank you for contacting the Federal Communications Commission (FCC). Unfortunately, the FCC has no loan programs."

Is there any doubt that we have been horn-swoggled?

I have instructed my attorney to start proceedings for either a class action lawsuit or the seeking of a court injunction to stop the FCC and the rest of the government from their cheap scam. I'll keep you posted — thanks for your support.

Gregg is absolutely right. The FCC has no damned business demanding our SSNs, and the ARRL made a gross mistake in supporting the FCC on this. — Wayne.

New Millennium Wish List continued from page 13

talk coast-to-coast (plus a bit farther at times) via AO-27 (**Photo D**). If you

like exciting activities, you'll love AO-27!

SO-35

This relatively new OSCAR also carries an FM repeater, and it too can be accessed using a hand-held talkie or a low power and full duplex FM mobile transceiver. Its uplink frequency is 436.300 MHz and its downlink 145.825 MHz, but these can be changed for some very interesting activities. SO-35 can also be configured as a single frequency parrot repeater receiving for 8 seconds and then retransmitting what it copied during the following 8 seconds. As this article is being written, SO-35 is expected to be released for regular use any day. Monitor the AMSAT Net on 14.282 MHz Sundays at 1900 GMT for the latest news, and check Andy MacAllister W5ACM's "Hamsats" column for more guidance.

RS-13

This low-orbiting Russian sat receives on 15 meters and relays signals on 10 — a mode "KA" operation. Typically, you can operate RS-13 using no more than 50 watts of uplink power to a vertical or dipole antenna while receiving its downlinked signals in a similar way. You can even operate through RS-13 while mobile. Again, more will be forthcoming here in 73.

Rig users' nets

These nets are great if you're devoted to collecting or restoring classic gear or want to stay abreast of the latest in accessories and modifications for a new or existing rig. The frequency and time listings for the Kenwood and Yaesu nets, incidentally, were missing from my log notes. Please send if you have.

Conclusion

I hope you now have a better idea about these hot topics in today's ham radio. Not to be forgotten in the new 73 will also be coverage of such other popular interest areas as fox hunting (ARDFing — see Joe Moell KØOV's

"Homing In"), microwaves (Chuck Houghton WB6IGP's "Above and Beyond"), antennas, new products, and of course 73's long-time staple, great construction projects.

There is something for everyone in this new millennium's amateur radio, regardless of license class, age, gear, or budget. Go for it!

Secrets of Transmission Lines continued from page 35

around the twinlead. This makes a capacitor. See whether you can find a location along the twinlead where you can make the line impedance match or flatten out on the generator side. Try the same trick with a 600-ohm termination.

Conclusion

Next time, we will conclude the series and present some computer programs suited to transmission line work and impedance matching, as well as have a general discussion on which circuits are appropriate for which impedances.

ON THE GO

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Because of this, it is often preferable to not have CTCSS activated on a repeater. Of course, if there are two repeaters on the same frequency located near each other, that is another story. Many times, when you hear a particular repeater you can be pretty certain that you can hit it. At other times, the path may be only in one direction, so you can hear a repeater and not hit it or even be solidly into a particular repeater without hearing it.

Try it!

The bottom line is that ten meter FM is a great aspect of the hobby. It is possible to work the world with a minimum of equipment and effort. With the repeater frequencies standardized, picking a frequency is almost automatic. Contacts are often short, to allow many hams to get in on the action. The biggest problem? Sometimes those who

Continued on page 61

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Happy New Year!

As you can see from the calendar, January will provide everything from Good (G) to Very Poor (VP) radio propagation conditions on the HF bands.

Briefly, you may expect seasonally good (G) propagation from January 1-10, but conditions are expected to deteriorate for the next three weeks, ranging from only Fair (F) to Very Poor (VP).

The worst days are anticipated January 14–16, 23–25, and 28–30, when a disturbed magnetic field and ionospheric storms are likely. Severe signal fading and even short-lived communications "blackouts" over polar propagation paths may be expected on HF bands above 40 meters. Prepare for other geophysical effects, such as severe winter weather in the northern hemisphere, during (P) and (VP) periods.

The best advice is to be prepared with emergency power, food, water, and warm clothing, and continue to monitor WWV at eighteen minutes after any hour for the latest reports of Solar Flux, BA, and BK indices.

The 80-75 and 40-30 meter bands should provide some good, low-noise activity in the US, Canada, and South/Central America, but DX will depend on a relatively quiet magnetic field. On the poor days, however, don't despair, since transequatorial skip and over-the-poles signals will be present. The polar paths will be weak and full of echoes, whereas the transequatorial path will provide stronger signals, sometimes even on poor days.

The 160 meter band ought to be good for much of the month, so watch the calendar for the good and fair days. The 20/18 meter and 15/12 meter bands will suffer the most along with 10 meters this month, so don't expect miracles. Perhaps in February we'll see some improvement, and March ought to get us back on the road to good worldwide DX conditions on all bands. Let's wait and see.

Remember to check the bands above and below the suggested ones for possible DX surprises. It's often a good idea to park your receiver on a seemingly unused frequency and just wait. A DX station is very likely to pop up before any one else hears him, and you can snag a good catch.

February

Seasonal effects: February is a transition month between December's winter solstice (shortest days and least ionization in the northern hemisphere) and the spring equinox in March when equal hours of daylight and darkness occur and propagation is considered to

be the best of the year.

Therefore, you can expect February to provide at least a week and maybe two of excellent long-haul DX propagation on the

HF bands, but you will have to pick and choose the best days (G) from the accompanying calendar.

Sunspot cycle effects: As we approach the anticipated maximum solar activity of Cycle 23, propagation conditions on the HF bands will also improve, and these — coupled with improved seasonal ionization — should provide a good month for DX chasers.

The calendar indicates that the first and third weeks of the month will be more favorable, with Good (G) conditions outweighing the less favorable Fair (F) or Poor (P) ones shown for the second and fourth weeks.

This is a Leap Year, and you can see that the extra day, February 29th, will be a good one.

		Ja	nuary 20	000		
SUN	MON	TUE	WED	THU	FRI	SAT
						1 G
2 G	3 G	4 G	5 G	6 G	7 G-F	8 F
9 F-G	10 G	11 G-F	12 F	13 F-P	14 P-VP	15 VP-P
16 .P	17 P-F	18 F	19 F-P	20 P-F	21 F	22 F-P
23 P	24 P-VP	25 VP-P	26 P-F	27 F-P	28 P-VP	29 VP-P
30 P	31 P-F					

February notes: The bands shown are likely to represent the highest frequency available to the desired areas at the time shown. Work from there to a lower fre-

		E/	ASTE	RN U	NITE	D ST	ATES	TO:				
GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	15					20	20	15	15			15
ARGENTINA	15	15	15	20/40	20/40	 			i		10	10
AUSTRALIA	15	15	_		20	20/40	20	20				
CENTRAL AM.	15	20	20/40	20/40	20/40	20	20	20	15	15	10	10
ENGLAND	40	40	40/30	40/30	40/30			10	10	15	20	40
HAWAII	15	15	20		40							15
INDIA	15	20			20	i						
JAPAN	15					20	20	15	15			15
MEXICO	15	20	20/40	20/40	20/40	20	20	20	15	15	10	10
PHILIPPINES	20				 	 	15			15	15	
PUERTO RICO	15	20	20/40	20/40	20/40	20	20	20	15	15	10	10
RUSSIA (C.I.S.)					†	T	20	15	20	20	T .	
SOUTH AFRICA	\vdash	4C	 	20	20	 		15	15	15	_	
WEST COAST	15	20	40/80	40/80	40/80	40/80	80	20	10	10	10	10
		CI	ENTR	AL U	NITE	D ST	ATES	TO:		'		
ALASKA	15	15	_		1	40	20	20	20	1	1	
ARGENTINA	10	15	20/40	20/40	t					-	15	10
AUSTRALIA	15	15	15	20	20/40	20/40	20	20		-	15	
CENTRAL AM.	15	20	20/40	20/40	20/40	20	20	20	15	10	10	10
ENGLAND					-	 -	20	15	10	15	20	<u> </u>
HAWAII	15	15	15	20	20/40	20/40			2C			15
INDIA	15	20	20	20							_	
JAPAN	15	15				40	20	20	20		_	
MEXICO	15	20	20/40	20/40	20/40	20	20	20	15	10	10	10
PHILIPPINES	15		20	20			20	20	15	15	-	
PUERTO RICO	15	20	20/40	20/40	20/40	20	20	20	15	10	10	10
RUSSIA (C.I.S.)								<u> </u>		20	20	
SOUTH AFRICA			40	20	-				15	20		
		W	ESTE	L	INITE	D ST	ATES	TO:	10			
ALASKA	15			20	20	20	20/40		20	15		
ARGENTINA	10	15	15	15	20	20	20/40	20	ZŲ	15		15
AUSTRALIA	10	10	15	15	20				00	<u> </u>	-	10
CENTRAL AM.	15	15	20/40			20	20/40	20	20	<u> </u>		- 10
ENGLAND	13	10	20/40	20/40	20/40	20		15	20	15	10	10
HAWAII	10	15	15	20	00/40	20/40	100	00	20	15	20	
INDIA	10	15		20	20/40	20/40	20	20			15	10
JAPAN	45	<u> </u>	15	L		00	00/40	20	- 00	15	<u> </u>	
JAPAN MEXICO	15	45	00/40	20	20	20	20/40	4.5	20	15		15
	15	15	20/40	20/40	20/40	20		15	- 45	1	10	10
PHILIPPINES	1-		00/40	00//0	20	20	20	20	15	15	L.	
PUERTO RICO	15	15	20/40	20/40	20/40	20	\sqcup	15	L		10	10
RUSSIA (C.I.S.)	<u> </u>				-			20	20	20	<u> </u>	
SOUTH AFRICA	L		1000	20	20		لـــــا		20	15	L	
EAST COAST	15	20	40/80	40/80	40/80	40/80	80	20	10	10	10	10

Table 1. January Band-Time-Country chart.

February 2000										
SUN	MON	TUE	WED	THU	FRI	SAT				
		1 G	2 G	3 G	4 G-F	5 F				
6 F	7 F	8 F-P	9 F-P	10 P-F	11 P-F	12 F-G				
13 G	14 G-F	15 F-G	16 G	17 G	18 G	19 G				
20 G	21 G-F	22 F	23 F-P	24 F-P	25 F-P	26 P-F				
27 P-F	28 F-G	29 G								

and south toward South America, the Pacific, and Asia during the later afternoon hours.

Short-skip openings between 1,000 and 2,500 miles should occur on good days.

15-17 meters

quency band when the higher frequency band is not open. Shaded areas = rare, and only on a "good" day. Blank spaces mean the path is not workable at that time. *15/10/20; **10/15/20.

Band-by-band conditions for January and February

10-12 meters

You can expect good band openings to the east toward Europe in the morning hours, with propagation slowly moving west On the good days, there should be excellent DX to many areas of the world, especially the southern hemisphere during the daytime hours. Signals will peak to the northeast and Europe before noon and to other areas in the afternoon. Regular shortskip openings beyond 1,000 miles are likely on all good days.

20 meters

Dawn to dark (and beyond) DX openings can be expected on good days. Peak signal strengths are anticipated an hour or two after sunrise and again in the late afternoon

and early evening hours. On the best days, the band should remain open during the night, particularly to the southern hemisphere. Short skip will extend from 500 to 2,500 miles.

30-40 meters

From sundown through the hours of darkness until sunrise you will find good DX openings to most areas of the world, particularly to the southern hemisphere. At night, short skip will extend beyond 700 miles, and during the day from 100 to 1000 miles, Remember that thunderstorms will begin to present themselves during daylight hours in some areas of the world, bringing static that could limit communications. You'll just have to work your way around them spatially and temporally.

80-160 meters

As spring approaches, these two bands tend to become quite noisy again, and the normally good nighttime DX openings will begin to be masked by static.

Nevertheless, you can work a lot of choice DX if you pick and choose our times of operation. During hours of darkness, 80 meters will provide some good DX.

Short-skip daytime openings on 80 meters can be found out to distances of 300 miles or so, and beyond 2,000 miles at night. There will be NO daytime openings on 160 meters. but DX to many areas of the world will occur during the night, with occasional short-skip openings between about 1,000 and 2,000 miles.

It is necessary to plan frequencies and times of operation to maximize the existing possibilities for successful DXing. The calendars will be helpful, but careful listening at ALL times is necessary. I also recommend listening to bands above and below the listed ones in the charts at the indicated times, as well as an hour or so before and after the indicated times. Also be aware that half-hour periods surrounding the transition from daylight to dark in your area can provide some unexpectedly strong signals and openings on ALL bands.

DX is always where and when you find it, but YOU must do the work. 73 and good DX, W1XU/7.

own ----

continued from page 59

ON THE GO

speak a second or third language may have the advantage!

Right now we are at the best time in the solar cycle to get into a new area such as ten meter FM. The sunspot cycle is improving and ten is starting to open up more frequently. We should have many months of continuing improvement before it even peaks, so there should be ample opportunity to enjoy this mode and band. The manufacturers know this and there are a number of exciting new rigs just coming out (see the review of the Alinco DR-M03 in this issue). Let me hear about your experiences in this exciting area of ham radio!

		E#	STE	RN U	NITE	D ST.	ATES	TO:				
GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	15	20		20	20		20	20		10		15
ARGENTINA	15/20	40/20	40/20	40/20					10	10	10	15
AUSTRALIA	10/15	20/15			20	40	20	20	10/15		20	10/15
CENTRAL AM.	15	20	20	80		40	-	10	10	10	10	10
ENGLAND	40	40/80	40/80	40/80	40			10/15	10/15	15	20	40
HAWAH	15/10	20	20	20	-20	40	40		15/10			15/10
INDIA		20	20				20	15			_	
JAPAN	15	20		20	20		20	20		10		15
MEXICO	15	20	20.	80	Ť	40		10	10	10	10	10
PHILIPPINES	15	†			\vdash		20	20	10/15			
PUERTO RICO	15	20	20	80		40		10	10	10	10	10
RUSSIA (C.I.S.)		i —					15/20	10/15	15/20			
SOUTH AFRICA	20	40							10	10	15/20	20
WEST COAST	15/20	20/15	15	40	40	40			20/10	10	10	10
		ÇE	NTR	AL U	NITE	D ST.	ATES	TO:				
ALASKA	10/15	15/20		1	20	Г	_	20		l		
ARGENTINA	20	20	20	20	20					10	15/10	15/10
AUSTRALIA	10	l		<u> </u>		40	40	20	20/10	15	15	15
CENTRAL AM.	20	20	80/20	80/40	40	40		15/10	15/10	15/10	15/10	15
ENGLAND	40	10/40	10/40	10/40				10/15	10/15	15/20	15/20	20
HAWAII	15/10	20	20	20	40/20	40/20	40	20		15		15/10
INDIA	20	15	20		†		20	20				-
JAPAN	10/15	15/20	_		20			20	_			
MEXICO	20	20	10/20	10/20	40	40		15/10	15/10	15/10	15/10	15
PHILIPPINES	10	20/15			<u> </u>				20	20		
PUERTO RICO	20	20	10/30	10/20	40	40		15/10	15/10	15/10	15/10	15
RUSSIA (C.I.S.)		40	40	20	20			. 15	10	20		
SOUTH AFRICA	20	40/20							10	10/15	15	15
		WE	STE	RN U	NITE	D ST	ATES	TO:				
ALASKA	·					Г	40	40			20	20/15
ARGENTINA	10	15	20	40/20	40/20	20			,	15	10	10
AUSTRALIA	10.	20	20				40			15		
CENTRAL AM.	20	30/40	30/40	40/80	40/80	40	- '		20/15	10	10	15
ENGLAND	1	-	-	40	40	20			10/20	10/15	20	20
HAWAII	15	15/30	15/30	20		40	40			15	.1.0	10
INDIA		T-20-2	20	_				-	20			
		30/15										15/20
JAPAN		30/15))	40	40			20	15/20
	20	30/15	30/40	40/80	40/80	40	40	40	20/15	10	10	15
JAPAN		**	.95.	40/80	40/80.	40	40	40	20/15	10	<u> </u>	
JAPAN MEXICO	20	30/40	30/40	40/80		40	40	40			10	15
JAPAN MEXICO PHILIPPINES PUERTO RICO	20 10	30/40 15	30/40				40	40	20	20	10 20	15 15
JAPAN MEXICO PHILIPPINES	20 10	30/40 15	30/40	40/80	40/80	40	40	40	20 20/15	20 10	10 20	15 15

Table 2. February Band-Time-Country chart.

Say You Saw It In 73!

continued from page 48

some friends on the 10-meter band. It's a lot of fun to see how low you can really reduce your power before you're into the noise. Although ten meters is a great band with which to work the locals on ground wave, it can produce some fantastic results at times. The ten-meter band is a QRP operator's delight! The popular New Jersey FB40 transmitter kit proves it is possible to transmit coast to coast with 40 milliwatts! That's less power than the dial lights consume in most transceivers. Now, just in case you're not familiar with the New Jersey fireball transmitters, they will be featured in an upcoming column. They operate in the ten-meter band. Simply key the VCC line and you're on the air. They run about 30 milliwatts (!) of RF output.

You'll find a lot of QRP activity on 40 meters around 7.040 and on 30 meters at 10.106. Reduce your power down to 3 or 4 watts and jump right in!

QRP operators hop around the bands a lot. You really need to change bands to see if there are any openings. Ten meters is a strange band. One minute it's dead and the next it's open worldwide.

If you want to make a large number of QRP contacts quick, then work the contests! To the other guy, you're a good source of points. Even if you're "not in the test," just hand out the reports and exchanges. Some of the QSO parties are the best place to work stations. I know I've heard guys calling "CQ OHIO QSO" party for hours just looking for a contact. Jump right in there with your call at two watts on SSB. You'll be heard, I guarantee it!

Efficiency is the key to QRP

I know you've heard it before, about the guy who works DX with a set of old bedsprings. Well, that's not going to cut it with QRP operation. You need the best antenna system you can muster up. Don't get me wrong — you don't need an antenna farm containing enough aluminum to build a B-52 to operate QRP successfully, but it wouldn't hurt either!

Antennas are placed as high in the air as possible. Only the best quality feedline is used between rig and antenna. Resonant antennas instead of trapped multiband antennas provide the QRPer with improved efficiency. Anything you can do to increase efficiency will improve your chances of making a solid QSO.

We're right in the middle of winter. It's a great time to check out low power operation on 80-meter CW. There's nothing like coming home from work when it's cold and dark, then firing up the QRP rig for some contacts. When it's so cold that the snow crunches under your feet, that's a great signal that the lower bands will be humming tonight! What better way to play ham radio than to drop the power down and dig out stations running low power just like you!

The solar flux is only getting better and better, so many of the higher HF bands such as 15 and 10 meters are staying open longer. Ten is a great band for SSB and a great place to start running QRP! I'll be looking for you on 10-meter CW!

NEUER SRY DIE

continued from page 38

didn't have a bachelor's degree. Advanced degrees seem to only affect teacher's salaries, not their ability to teach, which seems to go down proportionately with their so-called education.

If you want to get a good idea of what is really going on in our ed schools, please go to the library and read Rita Kramer's *Ed School Follies*. And then stop believing the crap the NEA is constantly drumming into us about the need for better teacher training, more teachers, higher salaries, and so on. Not one bit of that is true.

Under the present union system incompetent teachers aren't fired, just transferred — much like pedophile priests.

What's the answer? If you can find a politician who will push to close all college education departments, eliminate tenure, and allow school choice, get out there and elect him. Or her.

More Fluorides

In a paper sent to me by Roger Masters of Dartmouth College, I found the results of an extensive study of what happens to people who drink water which has been fluoridated.

Fluorine, as you probably know, is one of the most active elements known, so it should be no surprise that when it is added to our water supply, it attacks the pipes and the pipes' lead solder joints. The amount of lead this adds to the water supply is significant enough such that the study showed a children's IQ difference of five points between fluoridated water and nonfluoridated.

The study also showed that there is a consistent ten point IQ deficit when

children are bottlefed instead of breastfed. This just confirms many other studies which have shown the same deficit.

A 15 point IQ loss can make the difference between a college acceptance and a high school dropout.

And those are just two easily controlled factors that will determine a child's IQ for life. I've discussed several others in my past editorials, and I'll try to put all of these together into a book to help new parents avoid turning their budding geniuses into morons through an ignorance of what's involved.

Genes vs. IQ

One of the booklets I have available is my recommended classical music 100 CD Library (\$5). Anyway, apropos of geniuses, I got to thinking about symphonies, which are generally considered to be the heart of classical music. How many symphonies do you think have been written that are worth listening to more than once? Or even once, for that matter? Unless you are a classical music expert, you probably think there probably are hundreds. So I sat down and made a quick list. I came up with fewer than three dozen hits! And most of them were written in the 19th century, with just a few in the early part of the 20th. Nothing of even the slightest note has been written since.

The same thing applies to all the rest of classical music, including operas.

So what's gone wrong? Where are the musical geniuses of a hundred years ago? Where are the artists, sculptors, the inventors, and even the writers? What's happened? What's gone wrong?

There are three things that have changed which I'm convinced have contributed to this loss of geniuses. One has to do with several changes in the way we treat babies, both pre-natally and in early childhood. One has to do with our public school system, which has been intentionally designed to dumb us down. And the third has to do with poisons that have become popular in the last hundred years.

We've done quite a job on ourselves, really. A hundred years ago, Alzheimer's was unknown, cancer was an extreme rarity, and so on. But that was before we were buried in sugar, pasteurized milk, breakfast cereal, pop tarts, Danish, ice cream, and TV dinners. That was even before hot dogs, hamburgers, fries, and shakes.

Maybe you've read about the recent research which has shown that breastfed babies have an average 8 to 10 point IQ lead on bottlefed babies. That's been widely published.

Continued on page 64

Here are some of my books which can change your life (if you'll let 'em). If the idea of being healthy, wealthy and wise interests you, start reading. Yes, you can be all that, but only when you know the secrets which I've spent a lifetime uncovering.

.....Wayne

The Bioelectrifier Handbook: This explains how to build or buy (\$155) a little electrical gadget that can help clean the blood of any virus, microbe, parasite, fungus or yeast. The process was discovered by scientists at the Albert Einstein College of Medicine, quickly patented, and hushed up. It's curing AIDS, hepatitis C, and a bunch of other serious illnesses. The circuit can be built for under \$20 from the instructions in the book. \$10 (01)

The Secret Guide to Wisdom: This is a review of around a hundred books that will help you change your life. No, I don't sell these books. They're on a wide range of subjects and will help to make you a very interesting person. Wait'll you see some of the gems you've missed reading. \$5 (02)

The Secret Guide to Wealth: Just as with health, you'll find that you have been brainwashed by "the system" into a pattern of life that will keep you from ever making much money and having the freedom to travel and do what you want. I explain how anyone can get a dream job with no college, no résumé, and even without any experience. 1 explain how you can get someone to happily pay you to learn what you need to know to start your own business. \$5

The Secret Guide to Health: Yes, there really is a secret to regaining your health and adding 30 to 60 years of healthy living to your life. The answer is simple, but it means making some difficult lifestyle changes. Will you be skiing the slopes of Aspen with me when you're 90 or doddering around a nursing home? Or pushing up daisies? No, I'm not selling any health products. \$5 (04)

My WWII Submarine Adventures: Yes, I spent from 1943-1945 on a submarine, right in the middle of the war with Japan. We almost got sunk several times, and twice I was in the right place at the right time to save the boat. What's it really like to be depth charged? And what's the daily life aboard a submarine like? How about the Amelia Earhart inside story?If you're near Mobile, please visit the Drum. \$5 (10)

Wayne's Caribbean Adventures: My super budget travel stories - where 1

visit the hams and scuba dive most of the islands of the Caribbean. You'll love the special Liat fare which let me visit 11 countries in 21 days, diving all but one of the islands, Guadeloupe, where the hams kept me too busy with parties. \$5 (12)

Cold Fusion Overview: This is both a brief history of cold fusion, which 1 predict will be one of the largest industries in the world in the 21st century, plus a simple explanation of how and why it works. This new field is going to generate a whole new bunch of billionaires, just as the personal computer industry did. \$5 (20)

Cold Fusion Journal: They laughed when I predicted the PC industry growth in 1975. PCs are now the third largest industry in the world. The cold fusion ground floor is still wide open, but then that might mean giving up watching ball games. Sample: \$10 (22). Julian Schwinger: A Nobel laureate's talk about cold fusion-confirming its validity. \$2 (24)

Improving State Government: Here are 24 ways that state governments can cut expenses enormously, while providing far better service. I explain how any government bureau or department can be gotten to cut its expenses by at least 50% in three years and do it cooperatively and enthusiastically. I explain how, by applying a new technology, the state can make it possible to provide ail needed services without having to levy any taxes at all! Read the book, run for your legislature, and let's get busy making this country work like its founders wanted it to. Don't leave this for "someone else" to do. \$5

Mankind's Extinction Predictions: If any one of the experts who have written books predicting a soon-to-come catastrophe which will virtually wipe us all out are right, we're in trouble. In this book 1 explain about the various disaster scenarios, from Nostradamus, who says the poles will soon shift, wiping out 97% of mankind, to Sai Baba, who has recently warned his followers to get out of Japan and Australia before December 6th this year. The worst part of these predictions is the accuracy record of some of the experts. Will it be a pole shift, a new ice age, a massive solar flare, a comet or asteroid, a bioterrorist attack, or even Y2K? I'm getting ready, how about you? \$5

Moondoggle: After reading René's book, NASA Mooned America, I read everything I could find on our Moon landings. I watched the videos, looked carefully at the photos, read the astronaut's biographies, and talked with some of my readers who worked for NASA. This book cites 25 good reasons I believe the whole Apollo program had to have been faked. \$5 (32)

Classical Music Guide: A list of 100 CDs which will provide you with an outstanding collection of the finest classical music ever written. This is what you need to help you reduce stress. Classical music also raises youngster's IQs, helps plants grow faster, and will make you healthier. Just wait'll you hear some of Gotschalk's fabulous music! \$5 (33)

The Radar Coverup: Is police radar dangerous? Ross Adey K6UI, a world authority, confirms the dangers of radio and magnetic fields. \$3 (34)

Three Gatto Talks: A prize-winning teacher explains what's wrong with American schools and why our kids are not being educated. Why are Swedish youngsters, who start school at 7 years of age, leaving our kids in the dust? Our kids are intentionally being dumbed down by our school system - the least effective and most expensive in the world. \$5 (35)

Aspartame: a.k.a. NutraSweet, the stuff in diet drinks, etc., can cause all kinds of serious health problems. Multiple sclerosis, for one. Read all about it, two pamphlets for a buck. (38)

One Hour CW: Using this sneaky method even you can learn the Morse Code in one hour and pass that dumb 5wpm Tech-Plus ham test. \$5 (40) Code Tape (T5): This tape will teach you the letters, numbers and punctuation you need to know if you are going on to learn the code at 13 or 20 wpm. \$5 (41) Code Tape (T13): Once you know the code for the letters (41) you can go immediately to copying 13 wpm code (using my system). This should only take two or three days. \$5 (42)

Code Tape (T20): Start right out at 20 wpm and master it in a weekend for vour Extra Class license. \$5 (43)

Wayne Talks Not at Dayton: This is a 90-minute tape of the talk I'd have given at the Dayton, if invited. \$5 (50) Wayne Talks at Tampa: This is the talk I gave at the Tampa Global Sciences conference. I cover cold fusion, amateur radio, health, books you should read, and so on. \$5 (51)

SI Million Sales Video: The secret of how you can generate an extra million in sales using PR. This will be one of the best investments you or your busiReprints of My Editorials from 73. Grist 1: 50 of my best non-ham oriented editorials from before 1997. \$5 (71) Grist II: 50 more choice non-ham editorials from before 1997, \$5 (72)

1997 Editorials: 148 pages, 216 editorials discussing health, ideas for new businesses, exciting new books I've discovered, ways to cure our country's more serious problems, Flight 800, the Oklahoma City bombing, more Moon madness, and so on. \$10 (74)

1998 Editorials: 168 pages that'll give you lots of controversial things to talk about on the air. \$10 (75)

1999 Editorials: 160 pages of ideas, book reviews, health, education, and anything else I think you ought to know about. \$10 (76)

2000 Editorials: In the works.

Silver Wire: With two 3" pieces of heavy pure silver wire + three 9V batteries you can make a thousand dollars worth of silver colloid. What do you do with it? It does what the antibiotics do, but germs can't adapt to it. Use it to get rid of germs on food, for skin fungus, warts, and even to drink, Read some books on the uses of silver colloid, it's like magic. \$15 (80)

Wayne's Bell Saver Kit. The cable and instructions enabling you to inexpensively tape Art Bell W6OBB's nightly 5-hr radio talk show. \$5 (83) NH Reform Party Keynote Speech. It wow'd 'em when I laid out plans for NH in 2020, with outstanding and lower cost schools, no state taxes at all, far better health care, a more responsive state government, etc. \$1 (85)

Stuff I didn't write, but you need: NASA Mooned America: René makes an air-tight case that NASA faked the Moon landings. This book will convince even you. \$25 (90)

Last Skeptic of Science: This is René's book where he debunks a bunch of accepted scientific beliefs - such as the ice ages, the Earth being a magnet, the Moon causing the tides, and etc. \$25

Dark Moon: 568 pages of carefully researched proof that the Apollo Moon landings were a hoax. This is a capping

ncss will ever make. \$43 (52)	blow for René's skeptics. \$35 (92)
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Turn your old ham and computer gear into cash now. Sure, you can wait for a hamfest to try and dump it, but you know you'll get a far more realistic price if you have it out where 100,000 active ham potential buyers can see it, rather than the few hundred local hams who come by a flea market table. Check your attic, garage, cellar and closet shelves and get cash for your ham and computer gear before it's too old to sell. You know you're not going to use it again, so why leave it for your widow to throw out? That stuff isn't getting any younger!

The 73 Flea Market, Barter 'n' Buy, costs you peanuts (almost)— comes to 35 cents a word for individual (noncommercial!) ads and \$1.00 a word for commercial ads. Don't plan on telling a long story. Use abbreviations, cram it in. But be honest. There are plenty of hams who love to fix things, so if it doesn't work, say so.

Make your list, count the words, including your call, address and phone number. Include a check or your credit card number and expiration. If you're placing a commercial ad, include an additional phone number, separate from your ad.

This is a monthly magazine, not a daily newspaper, so figure a couple months before the action starts; then be prepared. If you get too many calls, you priced it low. If you don't get many calls, too high.

So get busy. Blow the dust off, check everything out, make sure it still works right and maybe you can help make a ham newcomer or retired old timer happy with that rig you're not using now. Or you might get busy on your computer and put together a list of small gear/parts to send to those interested?

Send your ads and payment to: 73 Magazine, Barter 'n' Buy, 70 Hancock Rd., Peterborough NH 03458 and get set for the phone calls. The deadline for the May 2000 classified ad section is March 10, 2000.

President Clinton probably doesn't have a copy of Tormet's Electronics Bench Reference but you should. Check it out at [www.ohio.net/~rtormet/index.htm]—over 100 pages of circuits, tables, RF design information, sources, etc. BNB530

Copies - 73 Magazine Nov. '63 thru Dec. '78. QST Magazine Nov. '63 thru Dec. '78. Ham Radio Magazine Mar. '68 thru July '79. CQ Magazine Dec. '64 thru Mar. '79. \$2.00 Each Copy plus shipping. W.L. Brown, Box 541, Sullivan's Island SC 29482. Tel. (843) 883-3574.

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BNB2630

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TELEGRAPH COLLECTOR'S PRICE GUIDE: 250 pictures/prices. \$12 postpaid. ARTIFAX BOOKS, Box 88, Maynard MA 01754. Telegraph Museum: [http://wltp.com]. BNB113

Wanted COLLINS S-LINE Pristine (RE) 32S3-A, 75S3-C, 516F2, 312B4, 30L1, or 30S1 and SM-3. Willing to pay top dollar for the station I have wanted since age 13. 1-512-925-3907 (cell), 1-888-917-9077(home), toll free residential, willbryant@aol.com WA5JUL Bill Bryant. THIS STATION IS FOR PERSONAL USE, NOT FOR RESALE!

NEUER SRY DIE

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When I get some time, I'll put all of the ways I've discovered for parents to raise their children's IQs into one book. From my viewpoint, any parent who does not make a major effort to increase their baby's intelligence is guilty of permanently maiming their child. It's like cutting off a hand or a foot. It's child abuse.

How much of an IQ increase is possible? If parents do the right things at the right developmental times for their children, I'm talking about a 40 to 50 point IQ increase! I'm talking a potential generation of geniuses. I'm talking about a possible revolution in all of the arts, sciences, and engineering.

My frustration is that I now have this information, which is scientifically backed up, but I don't know how I can get it to new parents. Oh, I could talk about it on the Art Bell Show, but his listeners are mostly retired people who don't sleep very well at night, plus some long haul truck drivers. And my 73 readers are mostly hams in their 60s, I need to reach teenagers and 20-somethings.

Please advise.

THE NEW! Amateur 78 Radio Today

MARCH 2000 ISSUE #472 USA \$3.95 CANADA \$4.95

Heilify Your Audio

The Amazing Square Loop Antenna

Demystifying Transmission Lines

On the cover: See page 29

TV Tuner Receiver — 50-900 MHz!

Today's NiCd Care

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THE NEW!

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Will the Digital Revolution Crush Amateur Radio?

Did the horseless carriage replace the horse and buggy? The pocket calculator made the slide rule obsolete. What did the audio tape cartridge do to the vinyl record pressing industry?

Will the audio compact disc (CD) ring the death knell for the audio cassette? Will the digital video disc (DVD) cause the demise of the video compact disc? The VHS video tape standard eliminated the use of the Beta format. Electronic desktop computers silenced the Frieden mechanical calculator with its obnoxious traveling carriage. Manual mechanical typewriters are dust collectors in closets. How many industries did the advent of the desktop computer of today decimate? How many industries did it annihilate?

But not to overlook, how many new industries has it created?

Now read this: The mega-speed home computers, in conjunction with the new broadband technology of the Internet, World Wide Web (WWW), and all of the various associated forms of information exchange, will diminish amateur radio even more.

Has amateur radio already taken a hit below the water line, and is the world's greatest hobby quietly and subtly sinking silently out of sight? Are the Hindenburg and the Titanic still operational?

If one chooses to declare that commercial broadcast TV viewing has reduced amateur radio activity. how much will E-mail usage further reduce amateur radio operating and exchanges?

Doesn't E-mail have more privacy than a QSO?

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NEUER SRY DIE

Wayne Green W2NSD/1

w2nsd@aol.com

Okay, 2000 is really here, and Y2K wasn't even a bump in the road. It's a new year, a new century, and a new millennium, and the FCC gave us a huge present on December 30th, when they tore down the wall between license classes. Oh, I would have preferred for the Commission to have cut us down to one class, but eliminating the Novice, Tech-Plus, and Advanced was a most welcome step.

Now, all that stands between a Technician and an Extra is the memorization of some Q&As, so we have the opportunity to start rebuilding our hobby. We can make the year 2000 the start of a whole new era in amateur radio.

I'd love to see tens of thousands of Techs Generalizing themselves and taking advantage of the sunspot maximum, enjoying the excitement of working around the world on ten meters, and even six meters! Being able to make worldwide DX contacts all night on 20m, and sending out teams to activate every recognized rare country.

We have the opportunity to build our ham clubs as centers to promote emergency communications systems; to organize DXpedition teams; to promote special interests such as packet, slow scan, satellites, RTTY, Amtor, spread spectrum, foxhunting; to provide technical education; to actively promote our hobby in local schools; and to work cooperatively to help clean up our bands.

I'd like to see our ham club presidents take the initiative to rebuild the hobby, rather than shrugging off the responsibility to the ARRL. We don't need the FCC to help us clean up our bands. We don't need to cringe at competition from the Internet for the minds of kids. We have a hobby that can provide excitement and adventure. It sure has for me! All we have to do is start promoting it.

Let's promote the hobby on radio and TV shows. Let's use the Internet in every way we can think of to get kids interested. Art Bell and I talked ham radio to his millions of listeners on January 5th for most of three hours. The result was bushels of mail asking me how to get a ham license. There are thousands of radio talk shows, all around the country, so make it your business to get the shows in your area in touch with me so I can spread the word.

I'd love to see hams who are comfortable with public speaking going into schools and getting the kids excited over the hobby. We should start hitting 'em at least by the 8th grade. Take along a camcorder and show the club members at the next meeting how excited the kids get when they find out about amateur radio. Then edit the tape and make it available for other clubs to show so they can get their members to give talks at schools and tape 'em. I'd love to have a list of such tapes published in 73. I've got excellent video tape duplicating facilities, so I could even help distribute tapes.

And while you've got your camcorder in action, how about doing a program on how to set up a ham satellite station? Or how to get involved with packet? How about some videos on the fiendish ways your club foxhunts have been



set up. A video of your club Field Day effort? Or a mountaintop VHF DXpedition?

With the new MacDV Special Edition computer and a digital video camcorder, you have a whole video production system. I got one for Christmas and I'm having a ball with it. I'm aiming at making some videos of me going into more detail on the history of the hobby, and elaborating on how you and your club can make the year 2000 the biggest and best in our history.

Let's get busy with club Web sites that will attract youngsters. Put programs on there that explain how much fun using your repeater can be. Let's have Internet/repeater interfaces. Let's have more repeater crossbanding. Let's make our ham club meetings so much fun that every ham within driving distance will come. Let's find exciting speakers. Get after any ham manufacturers or dealers in your area to come and talk. Video the talk and share it.

How about cleaning up our bands? We don't have to put that expense on the FCC—it's something we should be doing ourselves. The more trouble we are for the FCC, and the more expense we cause them, the sooner they'll get fed up with us, and that's something we sure don't need.

Amateur radio is a great hobby, but that isn't enough of an excuse for the government to spend money to support it. And yes, in times of emergency we're mighty handy to have around. But our real value to our country, to business and our government, is in our ability to attract youngsters to high-tech careers. As I've mentioned (endlessly), an ARRL survey just before they killed the American ham industry and most of our ham clubs - and almost killed the hobby 35 years ago with their incredibly stupid, greed-inspired. so-called Incentive Licensing petition to the FCC showed that 80% of all newcomers were teens and 80% of those went on, as a result, to high-tech careers. This was one big reason why the 1970s and '80s were the heyday of the American electronics industry.

Here we are in the 21st century, in a world where high-tech products and services are what make or break countries. Our high-tech industries are having to either import foreign-trained workers or move R&D and production to countries with better-educated work forces. Our colleges are graduating more foreign engineers than Americans.

So let's get busy and do the promotion of amateur radio that the League should have been doing. Let's visit our schools and get the kids fired up about the excitement and adventure our hobby makes possible.

If you haven't been getting adventure from amateur radio, it's not for any lack of opportunities. You just have

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QRX . . .

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Doesn't E-mail essentially function QRM-less? Do propagational conditions deter the movement of E-mail during the vast majority of the time?

Has the home PC helped to sustain amateur radio? Yes, it has. Has the PC advanced amateur radio? Again, yes, it has.

Slow scan amateur television (SSTV) has been improved via the dedicated notebook PC. Packet radio is but another real winner due to the home computer. Amateur radio positioning system (ARPS), weather information processing, satellite orbit calculations, and many other communication processes have all been helped by the use of all types of personal computers.

Will computer networking, audio and video conferencing, site surfing, home pages, and other yet-to-be-defined innovations cause amateur radio communication to follow the slide rule and/or the 8-track cassette? Color TV essentially eliminated the desire for black-and-white television. Has not a new world order of communications spelled doom for ham radio?

Can amateur radio publications, as an example, survive the upheaval technology has caused in their industry? Can amateur radio support industries make the massive changes to their businesses within a few short years in order to survive?

Obviously, some services (publications) have closed their doors forever. Those currently remaining must have learned to cope with a hobby that continues to rapidly change to match a technology base that is changing even faster.

Will amateur radio be around to witness the end of the next century, 100 years from now? Is it a fading "wanna-be" and in failing health at the beginning of this new millennium?

Even suggesting that amateur radio is decaying is akin to shouting "Fire!" in a crowded theater. Is the digital revolution, which changed so many things, going to change ham radio so much that it can no longer compete or even exist?

Amateur radio must seek change — and welcome it when it comes. It is essential to seek change. When change does occur, it often comes with confusion. If amateur radio is to survive, it must not run from change, it must be prepared to run toward it. Change imposed by the digital revolution is an opportunity if amateur radio can solve the problems therein related.

In order for ham radio to grow and not diminish, we must focus, prioritize, commit, and use whatever resources and technology are available. We must broaden our efforts and apply them in the areas in which we have been successful.

The case must be made for amateur radio, at heart, that we are a national service resource!

Have you ever heard or read about a young high school student who was a licensed radio

amateur shooting up his or her school? How many mass murderers can you name who were also active ham radio operators?

As a group we are not perfect or flawless, but we must be doing something right. There are many reasons for not allowing amateur radio to be overwhelmed by the huge tidal wave of digital technology. We owe it to ourselves and our hobby not to let it waste away, regardless what the case may be.

From providing emergency communication to comradeship, from electronic knowledge to the thrill of experimentation to giving our capabilities to our country in time of want, a need does exist for ham radio to stay viable and useful.

Thanks to Bill Parker W8DMR, 2738 Floribunda Dr., Columbus OH 43209-3120.

Cincy JOTA 1999

A joint effort on the part of two Cincinnati area clubs, the OH-KY-IN ARS and the Milford ARC, last October's Jamboree on the Air from Mitchell Memorial park on the west side of Cincinnati presented an excellent opportunity to demonstrate several aspects of ham radio, including both VHF and HF operation as well as 2-meter foxhunting techniques.

Following in the theme of the jamboree, Scouts were cycled among several operating locations and presented with the chance to exchange hellos with other hams across the United states, try their luck at transmitting CW, examine antenna designs and setup, and even try to sniff out several hidden 2-meter transmitters.

HF antennas consisted of a pneumatically powered 36-foot mast supporting a Mosley TA33 tribander, a 40-meter dipole, and a G5RV. Stations included a Yaesu FT-900 and a Kenwood TS-520.

666

Remember this number, because that is what the FCC is saying you will have to pay to take an Amateur Service exam this year — as if the bedeviled ARS doesn't have enough of a challenge in maintaining and raising its numbers without invoking the guy with the horns.

According to the Commission, the \$6.66 figure is based on last year's 2.6% increase in the Consumer Price Index. The ARRL VEC has already said that it will be rounding the figure off to \$6.65 when it begins collecting the new fee this year. Amen.

Thanks to the FCC and ARRL, via Newsline, Bill Pasternak WA6ITF, editor.

DARA Scholarships: \$2,000 in 2000

The Dayton Amateur Radio Association says that it is now accepting applications for its year 2000 scholarship awards program. Applicants must be graduating high school seniors and hold any class of FCC-issued amateur radio license. Completed applications must be postmarked before June 1, 2000. Requests for applications must be accompanied by a self-addressed stamped envelope. Send for one from DARA Scholarships, 45 Cinnamon Ct., Springboro OH 45066.

Thanks to DARA, via Newsline, Bill Pasternak WA6ITF, editor,

Bomb Scare Aloft!

My CW "squeezer" keyer was built into a black

plastic box. It functioned well, but you required several hours of patient practice to become proficient with it. Practice sessions included taking the new toy to bed with me and practicing "under cover," as it were.

On a commercial airliner, the "squeezer" rested in my lap and may have been the first laptop computer.

During our flight destined for Minneapolis, the stewardess was taking care of business and seeing that every

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Photo A. Jim WB8RRR controls the mike while Brian talks to a fellow Scout.

NEUER SAY DIE continued from page 4

to watch for them and then actually *do* something. Get off the couch.

Heck, any two hams in the New England area could have put together a couple of 10 GHz tenth-watt transceivers and worked seven states. But it was Chuck WA1KPS and I who actually did it, and believe me that was one hell of an adventure! Wow, that was exciting!

When I got my ticket, over 60 years ago, I did it the same way as everyone else: I memorized the ARRL Q&A License Manual. Even though I'd been building radios, hi-fi equipment, and transmitters for several years, I didn't really understand squat about electronics. Nothing in my high school or even the first two years of college as an EE student helped me to understand the fundamentals. Nothing in *QST* helped, either.

Then, along came WWII, when I had just turned 19, so I was prime cannon fodder. I joined the Navy and went through their nine-month electronics training. It was superb! Within the first three months, I had a grounding in electronics that's made it possible for me to keep up with tubes, transistors, and even computer circuit designs.

It won't be long. I predict, before we'll have a similar education series available on video, complete with a virtual laboratory where we can build power supplies and radios.

Of course, I'd like to see a series of teaching videos available to any kid interested. starting with the basics, and covering all aspects of electronic equipment — such as telephones, television, radio, facsimile, satellite systems, and so on. We should be getting kids in the fifth grade or earlier started so they'll be able to cope with the technologies they'll be using, and so they will be able to help design, manufacture, sell, and service high-tech products.

But, everything depends on you. You can nod and agree, and do nothing. Or you can

get started in getting your local ham club involved, triggering the startup of new school radio clubs, making your club meetings so exciting that you'll have to find a bigger place to meet, and so on. The ball's in your court. Will you help move our country toward a more prosperous future, or are you just going along for the ride during this incarnation?

Help!

There's only one of me and I have a serious conflict of interest. I want to do everything I can to keep 73 interesting and inspiring. I want to do all I can to help amateur radio grow so our country will be able to reclaim the high-tech industries we've lost to other countries. But, if you've been reading my editorials, you understand that I've discovered the secret to helping about 98.4% of Americans to be healthier (only 1.6% are in excellent health, according to a recent survey).

This hasn't left much time for me to do the job of editing 73 that I should have been doing, so I've been looking around for someone with the background and interest to grab the helm. I tried Dave K4TWJ in the last issue, but he was more interested in writing than editing, so that didn't work out and he's back with CO.

The main job of an editor is to work with the advertising department to find hams who can review new equipment. Since buying a new piece of ham gear is one of the most fun aspects of the hobby, our product reviews are eagerly read. The editor should keep an eye out for hams who are experts in some special interest and get them to contribute articles.

We're interested in articles helping newcomers to get involved with ham satellites, packet, RTTY, slow scan, DXing, QRP, moonbounce, aurora and meteor scatter contacts, and so on. If you've been having fun with some special ham interest, how about your helping new hams

get involved? What will they need in equipment? How do they get started?

Anyway, the editorial position is still open. And between E-mail and fax it's something that could be done from almost anywhere. The pay? Despite it being so much fun that payment should be completely irrelevant, we will provide a trickle of money. For any true-blue ham, editing a ham rag is nirvana. I'm not exaggerating, I've done it. Been-there, done-that.

Heck, when CO offered me the editor's job in 1955 I left the hi-fi speaker company I'd built from scratch into a multi-million dollar empire to take the job. The editor's job didn't pay much, but it allowed me to travel all around the world and to go on expeditions to weird places like Navassa Island. Boy, did I have fun! And I kept on working, even though they owed me a year's pay. Then, when they fired me, I bet every dollar I had on starting 73.

And More Help!

You'd like a fatter magazine, and so would I. There's just one way to guarantee that 73 will get fatter and that's if you'll help me to build the circulation. More readers will attract more advertisers. The economics of publishing dictate that we can publish one page of articles for each page of advertising.

You can help, too, by getting your friends and family to read my Secret Guide to Health. If we can get them to stop putting sugar, white bread, and other poisons into their bodies, their immune systems will be able to do incredible repair jobs for them. Maybe you've read about the recent studies showing a correlation between white bread and Lou Gehrig's disease. And the NutraSweet connection to multiple sclerosis. Well, I've been editorializing about stuff like this for almost 50 years now.

The Kook

A note from Frank Talmadge AA7IT says that he's lost friends by reading my editorials to them. "Wayne Green's a kook," they say. Well, of course they're right, from their viewpoint. It's much easier to call me a kook and thus not bother to examine the things they've been taught to believe in than to make the effort to think. Frank, any friends you've lost this way weren't worth keeping.

Almost everyone believes in doctors. I used to. They believe in college, as I used to. Some even believe in the Republican or Democratic parties. We all believe in the almighty dollar. We believe in NASA and space. We believe in fighting drugs. So I'm not picking the easy targets such as lawyers, judges, the police, or Clinton when I propose alternatives to doctors and college, and point out that we've been scammed just about every which way with our money, Social Security, the drug war, our public schools, the war on poverty, the Moon landings, our food supply, our drinking water, and so on.

If I were writing about things I hadn't carefully researched, I wouldn't expect to be taken seriously. This is why you see me citing the references I've found which back up the conclusions I've drawn.

I'd attract a bigger audience if I told people what they wanted to hear — if I repeated conventional stupidity. Oops, I should have said conventional wisdom, even though it's anything but that.

A New Record!

It's been taking me longer and longer to fast forward through the TV commercials (as I keep mentioning. I always tape any shows I might find interesting), so I wasn't surprised at an AP report that the average number of minutes of commercials during one hour of prime time is 11:12, up 14% from 1991. However, the current record holder is Buffy, the Vampire Slayer, with 23:46 minutes an hour! That's getting close to

Continued on page 44

The Quest for Super Sounding Audio

How to improve your on-the-air image by 10 dB.

Whether your preferred mode of operation is SSB, FM, or AM, here is the inside info on radiating a big-time signal with million dollar-sounding audio.

n increasing number of amateurs are becoming seriously interested in full-bodied audio. This is apparent on all bands and modes of voice communications, and is also reflected in the transceivers and accessories operators select. Some of the resulting on-the-air signals sound so good that you just stop tuning and marvel at their richness - rather than focus on what the operator is saying. Why this dedication to super-terrific

audio? Everyone has his own opinion. but I think it's because of our instinct to experiment as well as our desire to project a special on-the-air image.

"But my factory-supplied mike is a plug-in match for my transceiver, and my rig's ALC meter reads full range when using it. Surely that's good enough for general OSOs and mild-mannered DXing - right?"

"Good enough," sure. Outstanding? Questionable. Only when the audio

> response of your transmitted signal coincides with the audio range and response that brings out the best qualities in your own you voice can sound really superb. Accomplishing that goal calls for bringing together several variables in proper proportions.

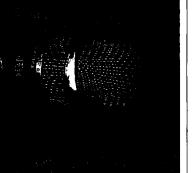


Photo A. Heil Sound's new "GoldLine" microphone is the ideal way to have a terrific studio grade sound plus a pileup-busting signal for DXing with one economically priced mike. What's the secret? It has two elements you select as desired by a small toggle switch mounted above the PTT slide switch. Details in text.

Paths to great sounding audio

the various ways extraordinary audio can be pursued.

The first place for possible improvement is the microphone used with your rig, as its audio response determines how much bass, midrange, and treble are initially available for processing. Next is the range and level of audio frequencies or tones passed, emphasized, and/or attenuated by your rig. Then, too, factory and/or in-field adjustment of injection oscillator frequencies (often called transmit DSP) determine the response of IF stages and crystal filters. This, in turn, influences whether a rig sounds predomibassy or tinny. Finally, nantly multiband audio equalizers like those found in professional recording studios are being utilized in some "all out" amateur setups to tailor a preferred mike for a specific response and sound. Let's take a closer look at each of these variables, beginning with amateur radio's most familiar and most continuously popular accessory: the microphone.

The mike makes the difference

Over the years, amateurs have Let's look at strived to obtain the most robust audio

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Phantom-Powered Mikes

A large number of today's HF and VHF transceivers are supplied with and/ or equipped for microphones utilizing condenser or "electret" elements. These mikes require DC power in the range of 1.5 to 8.0 volts to operate their element's associated preamp (which may be built into the element's case or contained on an adjacent/in-mike PC board). This "phantom mike voltage" (so nicknamed because it goes unnoticed or unrealized) is output from the transceiver's microphone socket and routed to the mike via its cable.

If a different type of microphone or mike element is directly substituted for a transceiver's matching electret microphone, phantom voltage may thus burn out the mike element. If the element can withstand phantom voltage without burnout, it can short-circuit phantom voltage and damage the transceiver.

How do you avoid this dilemma? Simple: Just be sure that you interrupt phantom voltage on the microphone's "hot" or positive wire before substituting another type of microphone or element. You may also need to increase mike gain to compensate for reduced gain from the disabled preamp — or you may be able to change only the mike element and leave the operating preamp intact.

Here's a simple way to identify and block phantom voltage. First, check your transceiver's manual and use your VOM to determine if and which mike socket pin carries phantom voltage. Then check inside the mike's case to determine if the voltage is applied directly to the element or only to an adjacent preamp (you may be able to continue using the preamp).

Next, insert a 1 to 5 µF 10 to 25 volt nonpolarized capacitor in series with one of the mike/element's leads to block DC and pass AC (audio). If a nonpolarized capacitor is not available, use two regular capacitors wired "back to back" as shown in Fig. A. Finally, check your new mike for proper gain and frequency response, and then enjoy projecting your new on-the-air image. — K4TWJ.

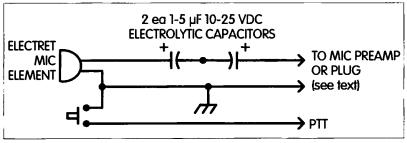


Fig. A. Using regular capacitors back-to-back.

possible on AM, FM, and SSB. Generally speaking, this was done by selecting a microphone or mike element that best fit your voice, or by adding an audio equalizer in the line between a favored mike and rig. Some all-time classic mikes making that list include Astatic's D104, Shure's 55SH and 444, Electro Voice's 664, and Collins' SM2.

One of the best sounding and most

reasonably priced microphones I have used and heard in use is Bob Heil's new "GoldLine" Model GM-4 or GM-5 shown in **Photo A**. Rather than being tailored for maximum talk power like Heil's HM-10 mike or HC-4 "DX element" cartridge, this new GoldLine mike's main element is expressly designed to produce a full-range "million dollar sound" for super QSOs. A second and switch-selectable element you



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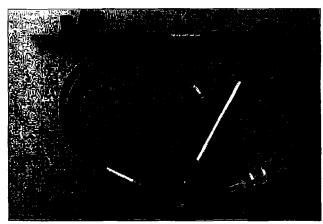


Photo B. Bob Heil's optional boom and preassembled mike-to-rig cables get you cooking with a new sound, a new image, and more desk room in short order. The boom and cable also add a professional "finishing touch" to a GoldLine mike's installation.

choose at time of purchase is also included in the GoldLine: a medium range and mellow sounding HC-5 or a more concentrated range and pileupcracking HC-4. You can thus project a "studio on the air" image one minute and (flip the mike's switch) a big-time DX signal the next minute. It's two mikes in one case!

Technically speaking, the GoldLine's main (studio grade) element has a frequency response of 50 Hz to 16 kHz, with a smooth rise of 4 dB centered on 2 kHz. This rise coincides with the upper range of most rigs' SSB filters, so, assuming sufficient mike gain, it adds a nice peak to the transmitted passband's upper end while retaining excellent low end bass. As a familiar

comparison, Heil's HC-5 element has a response of 300 Hz to 4 kHz, with a sharper rise of 6 dB at 1800 Hz (less bass, fewer highs, and greater midrange peaking). The well-known HC-4 element's response is 600 Hz to 2800 Hz. with a 10 dB peak at 2 kHz: an even sharper response with more peaking and "punch" for DXing.

Thanks to an optional desk-type support boom and optional cable sets (Photo B), installing and setting up a Heil GoldLine mike is a snap. The boom clamps to a desk edge (side or rear), is adjustable in length and tilt angles, and frees up desk space for contest logs, etc. The cable sets are preassembled for plugin-and-operate convenience. They include DC blocking capacitors to prevent mike or rig damage from phantom power, and are available for most popular transceivers (phantom power is typically used to power a rig's mating "factory mike").

Another option to consider (especially if your wallet is flat) is purchasing only a Heil HC-5 or HC-4 element and installing it in your existing microphone's case (use a capacitor to

block DC/phantom voltage, however!). These elements do not produce "Gold-Line-grade sound," but they outperform stock mikes by a mile. Gold-Line mike elements are not sold separately. They are available only as complete microphones. If you have an older vacuum tube-type rig, Heil also has a low-to-high impedformer for matching a GoldLine, HM-10, HC-5, or HC-4 to the vacuum tube circuitry (**Photo C**). All of these mike goodies are available from Bob Heil K9EID and friends at Heil Sound Ltd., 5800 North Illinois, Fairview Heights IL 62208; telephone (618) 257-3000. Check them out!

Rig notes

Like microphones, various makes and models of transceivers also exhibit their own distinctive on-the-air sound qualities — which can vary from "flat" to "fantastic." These variations are influenced by a rig's interstage coupling and bypass capacitors. IF bandwidth, and local oscillator or mixer injection oscillator's frequency.

How so? Coupling and bypass capacitors determine how much bass and treble pass through audio stages. Then, bandpass filters in IF stages shape and define the overall frequency response of the transmitted signal. Bear in mind that I am referring to transmitted bandwidth here, received bandwidth — which is usually the only measurement of selectivity listed or advertised in a transceiver's specs. Usually, but not always, transmitted and received bandwidths are the same — but don't take that for granted. Close study of your rig's circuitry tells the real story here.

Typical filter bandwidths for SSB are 2.1 or 2.2 kHz and 2.4 or 2.5 kHz, and in some rare cases, 2.7 or even 3.1 kHz. That addition of 300 or 400 Hz (bass or treble) may initially seem insignificant, but when associated transceivers are compared side-by-side, the difference is amazing. Narrow bandwidth rigs exhibit the most audio "punch" and "talk power," but wide bandwidth rigs just sound marvelous — assuming inclusion of a full range mike, naturally. Some lunch-time-type "napkin notes" should help clarify those statements.

Fig. 1 shows some approximate frequency response curves for Heil Sound's GoldLine, HC-5, and HC-4 mike elements (from top to bottom, respectively). The frequency response curve for an IF filter with a passband width of 2.2 kHz at its 6 dB points and 4.8 kHz at its 60 dB points is shown in



Photo C. Want to make your classic DX-100, Johnson Ranger, HT-37, or KWM-2 sparkle with dazzling GoldLine audio? This little low-to-high impedance transformer available from Heil Sound does the job in high style.

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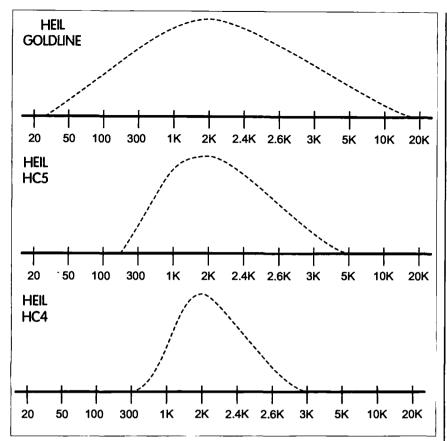


Fig. 1. Graphical analysis of how response curves of various mikes and a transceiver's IF passband filter mate to produce an overall on-the-air sound favoring bass, treble, full range, and narrow range response. Explanation and discussion in text.

Fig. 2. Above that response curve is a | illustrating the full voice range of 20 Hz straight-line graph (no peaks or nulls) to 20 kHz. Plot your selected mike's

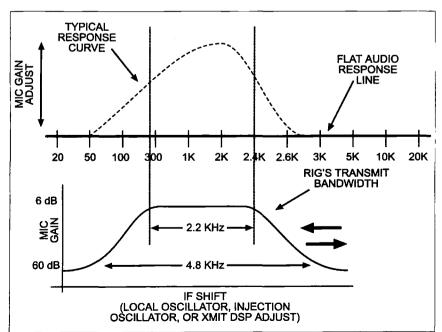


Fig. 2. Observing how your mike's response curve and rig's transmit bandwidth work together.

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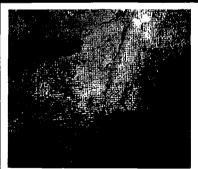
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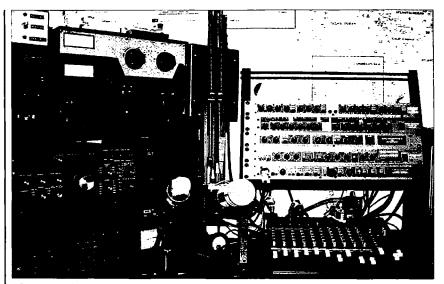


Photo D. John Basilotto W5GI gives us a peek at his secret ingredients for cooking up a super sounding signal. A Heil GoldLine mike connects to Aphex audio equipment consisting of a four-band parametric equalizer, an aural exciter, a "big bottom" booster, a compressor, a limiter, a reverb, and a mixer. Audio is then routed to his Icom 761 and Drake L4B amp. Whew!

response curve above the straight line (my dotted line serves as a getting started example), then plot your rig's transmit bandwidth curve on a piece of clear plastic or wax paper to lay over it. By placing one curve (transmit) above or under the other (mike), you can see how the two work together, emphasizing some tones, dropping others, etc. You can also see that a 2.2 kHz bandwidth (vertical dotted lines) has the added benefit of simultaneously transmitting more DX-grabbing high

tones and more robust and delightful-to-hear low tones.

Now, you can slide your rig's transmit curve left or right and notice how, even with a narrow passband, bass tones in the 50 to 300 Hz range or high tones in the 2200 to 2500 Hz range (but not both) can be included in the transmitted signal. That effect simulates adjustment of a rig's injection oscillator, and it also explains how two identical rigs can sound different.

Here is another interesting point. Newer transceivers have software/menu-adjustable injection oscillators. This feature is nominally called transmit equalization or transmit DSP, and gives you the ability to mate your rig's audio response with your mike and voice through menu-selected adjustments.

Continued on page 59

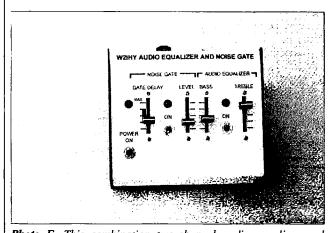


Photo E. This combination two-channel audio equalizer and noise gate is available in kit or preassembled form from Julius Jones W2IHY. It works with all 8-pin KenYaeCom rigs and mikes. Unit also works with Heil mikes and produces big-time sound at small-time cost.

Salvage Special: TV/VCR Tuner Receiver

Watch the neighbor's curb for an old VCR!

Do you salvage old VCRs for parts? Ham experimenters are always looking for a challenging project, so let me describe one that I started which you may find interesting. This project appears to have a lot of promise, but will require some ingenuity to work out some details.

ham friend mentioned that he was interested in building a receiver so that he could lie in bed at night and listen to TV audio. Of course, there are receivers available in addition to TV sets that do just that. Being a ham experimenter, my challenge was to construct a receiver from parts salvaged from an older VCR. The newer VCR tuners are digital, and that

makes them difficult to use. The tuner and the video/sound IF system from a VCR were just what the doctor ordered to meet my friend's needs! Although I didn't use the power supply, it would have been a good choice because all of the necessary voltages would have been available. However, for this project, the size of the power supply was somewhat critical, so one

was constructed from parts available from Radio Shack.

VCR receiver

Electronic TV/VCR tuners are capable of tuning a frequency band from about 50–900 MHz. A few frequency segments are skipped, but otherwise most tuners cover four ham bands, aircraft, part of the FM broadcast band, and some public service channels. The design of the tuner/IF system, as used in the VCR, monitors pretty much only the TV channels. Why? Modern TV and VCR receivers utilize a system called "intercarrier" to recover the audio signal from the received TV signal.

Taking a step backward for a moment, the sound and video signals are transmitted on their own carrier frequency, where they are separated by 4.5 MHz. In past years, two separate IF systems were used to accomplish the demodulation, and it was like having two independent receivers with the video operation at 45.75 MHz and the sound at 41.25 MHz. A single tuner was used, but the video and sound signals were kept apart and processed separately.

Later, an intercarrier system was

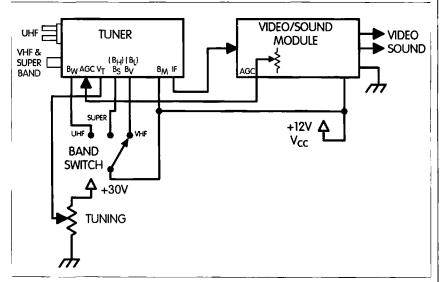


Fig. 1. Simplified functional diagram of a typical VCR tuner and IF module system. The bandswitch and tuning pot were added for clarity.

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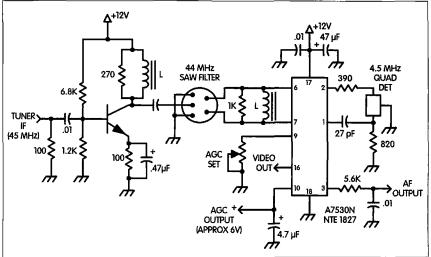


Fig. 2. Typical VCR single IC video and sound IF. The video output portion has been ignored.

developed to both simplify and reduce the parts count in the receiver. The sound IF at 41.25 MHz was dropped from the design; a simplified functional block diagram is shown in Fig. 1. Intercarrier refers to the use of a single IF at the output of the tuner that is then processed in support of the video, but has a bandwidth wide enough to pass the sound carrier. Toward the latter portion of the video IF, the sound at 4.5 MHz is split off and processed. The video carrier is AM (amplitude modulation) and is frequency stable, while the sound carrier is FM (frequency modulation).

Being stable, the video carrier is used as the "local oscillator" that is mixed with the FM sound carrier, creating an audio IF of precisely 4.5 MHz. Once separated from the video, the sound is processed and demodulated using a quadrature detector. Figs. 2 and 3 show typical (but simplified) VCR IF systems.

The first, Fig. 2, shows how a single IC is used both for video and sound processing. Table 1 lists a number of ICs that are also used in the type of circuit shown in Fig. 2, and is provided to help identify the correct module. Fig. 3 shows a simplified, but typical, dual IC video and sound IF processor circuit. Table 2 lists a number of ICs used in the dual IC configuration. NTE equivalent numbers are provided in the table listings where available, to aid in identifying IC pin functions. Whether one or two ICs are used, the IF system can be treated as one and the same when making up a receiver project. In most cases, the tuner and IF system can be salvaged as two modules. In some cases, the two modules are mounted on a common circuit board — and, they may, if desired, remain on the single board. Modifications will have to be made to the circuit traces on the board in order to apply the various required voltages.

As stated earlier, the original objective of the VCR circuit was to receive only TV video and sound. That means the audio can be recovered only as long as the video carrier is present to create the 4.5 MHz sound carrier. That makes the VCR receiver system a double conversion receiver. In order for the receiver project to support ham radio, it must be capable of monitoring signals in the ham bands that do not have a "video carrier" present to act as a local oscillator. For the receiver to "hear" the four (50, 146, 220, 450 MHz) ham bands and public service channels, a local oscillator must be added.

Local oscillator

In order to make the receiver function without the video carrier, a local oscillator must be provided and injected into the IF system as indicated in Fig 4. I've experimented with several methods for injecting the oscillator's



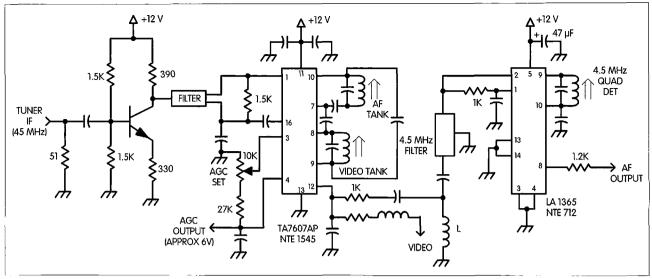


Fig. 3. Typical VCR dual IC video and sound IF. The video output portion has been ignored.

signal, but chose to perform the minimum amount of modification to the IF system. I suspect that there is a better way and place to inject the oscillator, but only further experimentation will

IC P/N	NTE Equiv.
A7530N	1827
AN5111	1440
AN5176K	
KA2919	1728
KA2923	1827
LA7502	15001
LA7520	1728
LA7530	1827
LA7550N	
LA7575	
M52354	1656
M51356P	1656
M51362SP	
M51365	7015
TA7678AP	
TA7680	1572
TA7681	1570
TAB677N	

Table 1. Typical ICs used in a VCR's single IC video and sound IF. This listing is provided to help identify a video/sound module.

provide the answers. Injecting the oscillator at the input of the SAW filter appears to work satisfactorily.

The new local oscillator must be offset from the tuner's IF by 4.5 MHz; the IF system was designed to accommodate a video signal at 45.75 MHz and a sound signal at 41.25 MHz. To accommodate that offset, I injected a 46 MHz signal during the experiment, but almost any signal frequency from about 44.5 to 47.5 MHz will work well, as the sound's quadrature detector will accommodate the shift without any degradation in performance.

I've shown the use of a commonbase Colpitts oscillator as a suitable choice for this application. The crystal, series-resonant (typically a 3rd overtone), is placed in the base circuit to ground.

Specific circuit values will have to be worked out to accommodate the parts available from your junk box. When the oscillator is in operation, the injection level of the signal appears to have a minimum threshold level of about 25 mV, with a maximum level at about 150 mV. I used 75 mV in my tests, so a means for controlling the injection amplitude may be required. I was successful in using a 1-30 pF compression padding capacitor for controlling the injection level. Adjustment of the injection is done with a known ham band signal being present. and the capacitor is adjusted for maximum recovered audio. At that point the padding capacitor may be fully compressed. No further adjustment is then required.

A switch is used in the 12 V supply line to the oscillator so that it may be disabled whenever TV audio is being received.

Audio amplifier

Since the salvaged IF system may not have an audio amplifier included, I'm suggesting one that will work with this tuner receiver project. A single LM386 audio IC, as shown in Fig. 5, or an LM380, will work well in this application. The circuit shown will drive either a speaker or a set of headphones to an adequate level.

Because the audio obtained from the IF system has no de-emphasis, a de-emphasis circuit should be added. Although it's OK to operate without de-emphasis, the hiss level may be a little hard to handle over a long period of time. Rolling off the high frequency portion of the hiss with an RC network makes the noise more tolerable. There is no squelch circuit in the VCR IF system, but you can build one if you desire.

I chose the de-emphasis network values to roll off the hiss to meet my hearing needs and for listening to voice modulated signals. If the receive system is used for listening to TV or

VIF	NTE Equiv.		
AM167013A	749		
AN5111	1440		
HA11215A	1469		
TA7607AP	1545		
TA7644BP/AP			
UPC1366	1522		
SIF	NTE Equiv.		
AM167001A	712		
AN5215	1234		
AN5250	1404		
GL3201	712		
HA1124	712		
HA11229	1575		
KA2101	712		
LA1365	712		
LM3065N	712		
LSC1008P	712		
M51173P			
TA7337P			
TBA120AS	1292		
UPC1391H	1668		
UPC575C2	1140		

Table 2. Typical ICs used in a VCR dual IC video and sound IF. IC listing is provided to help identify a video/sound module.

FM audio, then some experimentation with the de-emphasis circuit values may be desired to adjust the audio passband in support of music. Reducing the 0.01 µF capacitor values to 0.005 µF may satisfy your desire.

Power supply

Power requirements for the receiver system project are really minimal, but the voltages need to be stabilized. A suitable power supply for the tuner receiver project is shown in Fig. 6.

Specifically, the tuning voltage requires regulation to prevent it from wandering around. When setting the maximum tuning voltage, the target value is 30 volts, but that may not always be achieved, and a value of 28-29 volts is acceptable. The final voltage is determined by raising the regulator's output (using the VOLTAGE SET pot) to maximum and then backing it down slightly to bring the output under regulator control. Regulation is uncertain at the maximum value because of the loss in regulator headroom, but pulling it down slightly allows the regulator to function properly.

Because of the low current being drawn by the receiver system, no heat sinking of the regulators is required. If desired, the regulators may stand vertical on a PC board, or be laid flat against the board.

Circuit notes

Fig. 1 shows the requirements for enabling the tuner so that it will cover

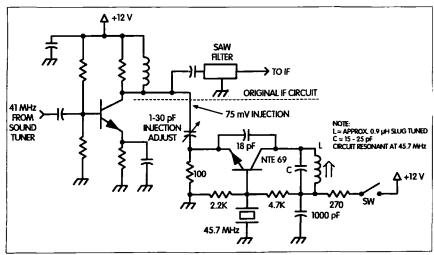


Fig. 4. Suggested local oscillator to be added for signal injection. Variable level injection is used for best conversion. A switch is used to enable/disable the oscillator.

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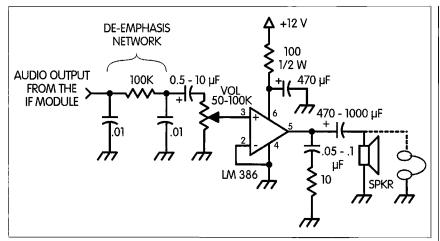


Fig. 5. A suitable audio amplifier to be used with the VCR sound IF, which can drive either headphones or a small speaker.

the available bands using a bandswitch that puts +12 V onto the band select pin of the tuner.

Fig. 6 shows how the tuning voltage line is to be controlled with a multiturn pot. A small value pot is connected in series with the tuning voltage pot that will function as a fine-tuning control. This pot is set normally to its center position and then rocked back and forth for a fine tuning adjustment. As an alternative method, a pot may be used to control a small voltage (typically 2 volts maximum) applied to the AFC terminal.

Tuning TV audio signals is very easy with the tuning pot, but hams and public service present a narrow tuning target and require the use of a fine tuning control.

All tuners require an AGC voltage in the range of +6 to +7 volts. The desired voltage may be obtained from the AGC pot located within the IF module, as is done in the VCR configuration, or the AGC voltage may be obtained from a pot dividing the +12 volts. If the latter is chosen, the pot value may be 10k and it will also function as an RF gain control.

The antenna input impedance for the tuner may at first appear confusing, but a 52 ohm transmission line works well with TV/VCR tuners. When connecting to the UHF input, tie one pin to ground and connect the other to the center of the coax connector. Each of the antenna inputs will require a suitable antenna for the frequency band to be covered. A suitable antenna may be connected to the respective input because the bandswitch will enable the antenna input as required by the tuner.

Performance

To gain an understanding of the tuner-receiver's sensitivity, I measured the input sensitivity while operating in the 450 MHz ham band and found it to be approximately 10 µV to achieve background noise quieting. Even at 10 μV, ham repeaters located many miles away provided quieting signals. When used as a TV audio receiver, the performance is as desired, but when monitoring the narrow deviation as used in the ham and public service bands, the recovered audio amplitude appears to be a little on the low side. More audio amplification may help resolve that issue.

Continued on page 59

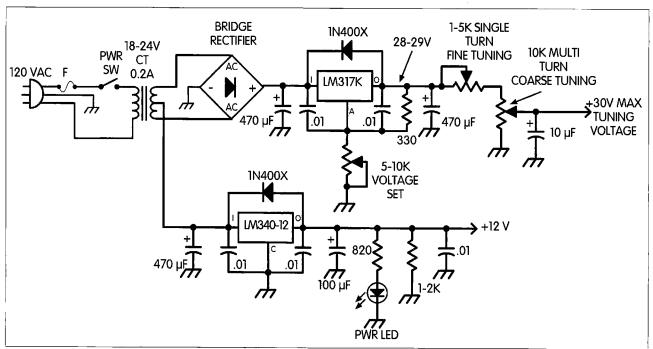


Fig. 6. A suggested power supply for powering a tuner and IF module.

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The Care and Feeding of NiCds Some clever tips for long life, plus a neat home-brew charger.

In today's world of rechargeable lithium-ion, nickel metal hydride, and renewable alkaline batteries, traditional nickel cadmiums may still be your most logical and cost-effective choice. Here, long-time battery wizard K9TRG explains some ground floor facts and offers up an easy-brew charger for these gems.

There has been *much* misleading information about NiCds. First of all, memory in most modern NiCds is almost nonexistent today. Much has been written about completely discharging NiCds before recharging them. If a NiCd cell is discharged much below the standard test voltage of 1 or 1.1 volts per cell, you stand a good chance of permanent cell reversal and loss of cells.

Some electronic devices have a low voltage cutoff circuit that is supposed to stop the complete depletion of the battery. It's possible that this is what was meant by completely discharging the battery before recharging. The statement is misleading, as it is wrong to allow a NiCd battery discharge to even near zero volts per cell.

The standard test for NiCd cells is capacity in mA. times one hour. Thus, a 450 mA cell or battery should deliver 450 mA for 60 minutes before it drops below 1.1 volts per cell.

It is difficult to have long battery life with quick or rapid charging. Heat is the enemy of any type of battery. Rapid charge batteries use several methods to prevent overheating and are only partially successful.

The charger circuit I would like to show here will solve several problems. First, it is inexpensive, simple, and has only a few parts. Secondly, you will have some fast charge capability, but more important, you will be able to leave the charger on forever, with no overcharging. This design has been used for 15 years on some batteries, and they are still going strong. A view of the charger's PC board assembled and ready for use is shown in **Photo A**.

A view of the PC board (only) is in Photo B, and its circuit diagram is in Fig. 1.

We take advantage of some fixed assets in this design, for cost, simplicity, and safety. Select your power transformer keeping the following in mind: NiCds should be charged at 10 percent of their rated capacity. A 450 mA battery should be initially charged at approximately 45 mA, so a 50-75 mA transformer is acceptable. This is one of the fixed assets, to prevent battery overcharging.

As for the AC output voltage, select a transformer with a voltage rating about 1.4 times the desired DC voltage, plus .75 volts for each of the 2 diodes and regulator. If, for example, you want to charge a 12 volt battery pack, the AC RMS voltage should be about 19 volts. Any more, and you will

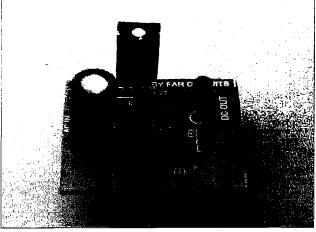


Photo A. The K9TRG multipurpose NiCd charger assembled and ready for interconnection to an external transformer, as discussed in text. Board is only 1.5 inches square. Photo by K4TWJ.

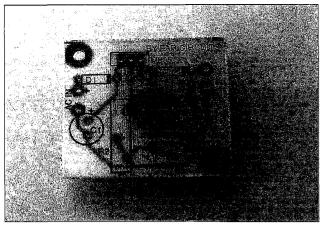


Photo B. FAR Circuits' PC board of the K9TRG multipurpose NiCd charger is pre-drilled and silk-screened, with a parts placement guide for easy and foolproof home assembly. Photo by K4TWJ.

have excessive heat to dissipate; any less, and you will not have enough voltage to reach the full rated charge current. The excess heat is not a problem for the regulator, provided you use the proper heat sink. Wall transformers are a good choice, as they are plentiful and inexpensive at hamfests.

The next fixed asset we take advantage of is the 7805 regulator. It is rated at 1 amp if properly heat sinked, but more importantly, it has thermal limiting. The 7805 regulator is normally fixed at 5 volts; however, with 2 extra

resistors it can be configured for any output voltage from 5 to 30 volts.

To describe the circuit and the built-in safety features we mentioned earlier, we use the current limiting of the transformer as part of the method to avoid overcharging the battery. The fixed asset of the 7805 voltage regulator is its internal

thermal overload protection. Unless you are charging high current batteries (that need over 200 mA), we recommend you delete the heat sink. The regulator will pass 100–200 mA with out it for some time and will shut down automatically if you accidentally draw more current for some period of time. This *also* protects the battery from overcharge.

D1-D2 can be almost any silicon diodes; 1N4001s should work well here, as they are rated at 1 amp and have a PIV of 50 volts. For the 10 cells used

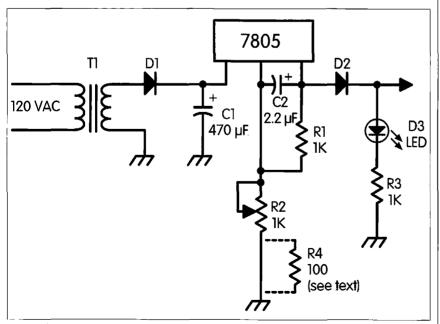


Fig. 1. Circuit diagram of the multipurpose K9TRG charger. PC boards for easy assembly available from FAR Circuits.

Parts List				
Name	RS No.	Cost		
D1, D2	276-1101 or 276-1102	2 for \$.49		
D3	276-026	2 for \$1.29		
C1	272-1030	\$.99 ea.		
C2	272-1435B	\$.69 ea.		
7805	276-1770	\$1.19 ea.		
R1, R3	271-1321	4 for \$.49		
R2	PCB 271-342 \$1.4 Far Circuits, 18N640 Court, Dundee IL 601 (847) 836-9148; \$3.0			
РСВ				

Table 1. Parts list.

for this article, R1 is 1000 ohms and R2 is a 1000 ohm, 15-turn Radio Shack pot for easy vernier fine tuning. R2 ideally should be closer to 1500 ohms, but is not easily available; add 1-2-300 ohms for more R4 if a little more output voltage is required. Be sure to place a jumper in its place if you use the FAR Circuits PC board, and do not use the extra resistor. R3 is 1000 ohms and D3 is an LED to indicate power; both may be deleted if desired. C2 is a 2.2 µF. tantalum, C1 is 470 µF, and both can be rated at 25 to 50 volts. D2 prevents a back voltage of the battery from destroying the regulator. Charging voltage for NiCds should be about 1.4 to 1.45 volts per cell at full charge, or approximately 10 x 1.43 = 14.30 volts for a battery pack. NiCds like some AC component in their charging. In fact, some inexpensive chargers use 115 volts AC from the line with a current limiting resistor, or pilot light, and a diode, period.

Now we need a little patience to adjust *properly*. Set R2 to maximum voltage, and monitor the charge *current*. Adjust R2 for about 10 percent of the rated capacity of the battery or pack. Leave this setting for 24 hours. Then *slowly* adjust R2 so that the charge current is about 1 or 2 percent of the battery capacity; the charge voltage should be about 14.32 volts. Leave this set for another day or so, then reset R2,

Continued on page 60

Secrets of **Transmission Lines**

Part 7: Impedance matching.

In the previous chapter, we saw that a mismatched line can be corrected by placing a stub at the appropriate point on a transmission line. In this, the last chapter of the series, we will be looking at some techniques for impedance matching.

The use of stubs for matching is generally confined to UHF and microwave frequencies. At 2 MHz, a quarter-wave stub is 123 feet long in air dielectric line, and 80 feet long in polyethylene insulated line. A lumped parameter circuit, coils and capacitors, would be more convenient and probably cheaper at these frequencies.

We also saw that it is frequently convenient to use admittance parameters, as well as the use of the Smith Chart. in transforming impedance to admittance and vice versa. The program in Table 1, written in BASIC, is a quick way to perform the inversion. Note that the two circuits may be equivalent. but they can have very different values. Let us assume a frequency of 4 MHz. Suppose that we measure an impedance of 40 + i60 ohms. This is a 40ohm resistor in series with a 23.9 uH inductor. Transforming this to admittance, we obtain 7.69 - j11.5 mmho, which is a 130 ohm resistor in parallel with a 34.6 uH inductor. Note that both the resistor and inductor values have changed significantly. While the component values have changed significantly, both circuits have the same power factor and phase angle. If concealed inside a box with only the two terminals brought out, it would be impossible to distinguish the circuits if measurements were made only at 4 MHz. Of course, measurements at other frequencies would permit distinction.

The transmission line equations

With the wide availability of personal computers, the most common means of solving the transmission line equation is by computer rather than

```
20
                      Y/Z INVERSION
30
                     BY JACK KEUCKEN
40
                         03/16/95
60 CLS
70 INPUT "IS INPUT DATA Z OR Y?"; A$
80 IF A$ = "Y" GOTO 300
81 IF A$ = "y" GOTO 300
90 INPUT "ENTER R";R
100 INPUT "ENTER X":X
110 DEN = ((R*R)+(X*X))
120 G = R/DEN
130 B = -X/DEN
140 PRINT "ADMITTANCE IS";G;"+J";B;" "
150 INPUT "PRESS ANY KEY TO CONTINUE"; B$
160 GOTO 60
291
                   Y TO Z TRANSFORMATION
300 INPUT "ENTER CONDUCTANCE IN MHOS": G
310 INPUT "ENTER SUSCEPTANCE IN MHOS":B
320 DENY = ((G*G)+(B*B))
330 R = G/DENY
340 X = -B/DENY
360 PRINT "IMPEDANCE IS"; R:"+J"; X:" "
370 INPUT "PRESS ANY KEY TO CONTINUE"; B$
```

Table 1. Y/Z inversion program in GWBASIC.

graphically on the Smith Chart. The program in **Table 2**, also written in BASIC, is a means of solving the transmission line equations. Lines 200 and 210 are included to prevent division-by-zero errors. The program asks for the line Zo and defaults to 50 ohms if none is entered. The line electrical length is called for in wavelengths. This permits one to work in either feet or meters. Conventionally, wavelengths are given in meters; however, you may work wavelengths in feet if you choose. The length must be corrected for the velocity of propagation on the line.

 $\lambda = 300/F$ meters eqn (7-1)

where

 λ = wavelength

F = frequency in MHz

For example, let us assume that we have a Teflon-insulated cable that is 2.5 meters (8.2 feet) long. (To convert meters to feet, multiply by 3.28.) At 10 MHz, $\lambda = 300/10 = 30$ meters. The cable electrical length is 2.5/(30*.65) = 0.128 wavelengths. Teflon cable has a Vp of .65. You can look up the cable

Vp in the manufacturer's data or a handbook.

For another example, let us consider in **Table 3** the results for a transmission line with an electrical length of 2.5 meters at a variety of frequencies terminated in a 10 ohm resistor.

The Smith Chart illustration in Fig. 1 shows this data and tells us why the Smith Chart has hung on in popularity. I doubt that there are more than three people in the world who could look at these data columns and realize by inspection that they represent a 5:1 VSWR circle. On the other hand, it is pretty obvious from the Smith Chart figure that the data path is concentric about the center of the chart.

Notice that the electrical lengths listed are all positive and go toward the generator. If you enter any of the R and X values along with the negative of the electrical length, you will get back to the 10 + j0 with some small truncation errors.

The fact that the chart spirals clockwise with increasing frequency is not to be neglected either. If your data ever shows a counterclockwise spiral with increasing frequency over any significant span, there is something dreadfully wrong with your measurements. For this to happen, we would have to have inductors whose reactance decreases with increasing frequency, and capacitors whose reactance increases with increasing frequency.

Note that a terminating load that is purely resistive will have a constant VSWR with changing frequency; however, a termination with a reactive part will have a VSWR that varies with frequency. For example, a termination with a series inductor that measured 10 + j10 ohms at 10 MHz would look like 10 + j20 at 20 MHz and 10 + j30 at 30 MHz. Obviously, the VSWR is increasing with increasing frequency. By a similar token, a termination with a series capacitor would have a VSWR that decreased with decreasing frequency

You will frequently use negative line lengths with this program, since the more common case is that you have the impedance bridge and signal generator on the ground and the antenna

```
110 REM
                    TRANSMISSION LINE EQUATIONS
120 REM
                           BY JACK KEUCKEN
130 REM
                                 09/12/97
150 CLS
160 PI = 3.14159265#
170 INPUT "ENTER LINE ZO"; ZO
171 IF Z0 = 0 THEN Z0 = 50
180 INPUT "ENTER REAL PART OF LOAD"; ZR
190 INPUT "ENTER IMAGINARY PART OF LOAD";ZI
200 IF ZR = 0 THEN ZR = .000001
210 IF ZI = 0 THEN ZI = .000001
220 INPUT "ENTER LINE LENGTH IN WAVELENGTHS": BL
230 PRINT "A LINE OF"; ZO; "OHMS WITH AN ELECTRICAL LENGTH OF"; BL;
"WAVELENGTHS"
240 IF ZI<0 THEN J$ = "-J" ELSE J$ = "+J"
250 PRINT "TERMINATED IN A LOAD OF"; ZR; J$; ABS(ZI); "OHMS"
260 BL = 2*PI*BL: REM CONVERT TO RADIANS
280 REM
                            THE CALCULATION
290 AN = TAN(BL)
300 ZI2 = Z0*AN
310 IMN = ZI+ZI2
320 NUM = SQR((ZR*ZR)+(IMN*IMN))
330 RED = Z0-(ZI^*AN)
340 IMD = ZR*AN
350 DEN = SQR((RED*RED)+(IMD*IMD))
360 PHNUM = ATN(ZR/IMN)
370 PHDEN = ATN(RED/IMD)
380 MAG = NUM/DEN
390 ZS1 = Z0*MAG
400 PH = -(PHNUM-PHDEN)
410 RZS = ZS1*COS(PH)
420 IZS = ZS1*SIN(PH)
490 IF IZS<1 THEN J$ = "-J" ELSE J$ = "+J"
500 PRINT "THE INPUT IMPEDANCE IS"; RZS; J$; ABS(IZS); "OHMS"
510 V1 = Z0-ZR
520 V2 = SQR((V1*V1)+(ZI*ZI))
530 V3 = Z0+ZR
540 V4 = SQR((V3*V3)+(ZI*ZI))
550 V5 = V2/V4
560 PRINT "THIS CORRESPONDS TO A VSWR OF";((1+V5)/(1-V5))
570 STOP
2200 RUN
```

Table 2. Transmission line equations program in GWBASIC.

f (MHz)	Len. el.	R	x	
10	0.0833	13.2	+j 27.3	
20	0.167	35.9	+j 74.5	
30 0.25		250	+j 0	
40 0.33		35.9	−j 74.5	
50 0.417		13.1	−j 27.2	
60 0.5		9.98	−j 0	

Table 3. Data for a transmission line with an electrical length of 2.5 meters.

will be in the air at the other end of a transmission line. You insert a negative line length to rotate the impedance back to the antenna so that you can see what it takes to match the antenna.

Sometimes you have the situation where you have an impedance measurement and you would like to know the VSWR. This can be done graphically on the Smith Chart, or you can use the computer program with a very small line length — like 0.000001 wavelength.

The right place for matching

The very best place for impedance matching is always right at the discontinuity. There are three reasons for this:

- 1. The longer the transmission line, the more the data are smeared out by the transmission line effect. If the impedance is matched right at the discontinuity, it will nearly always have the maximum matched bandwidth.
 - 2. High VSWRs de-rate the cable.
- 3. Line loss effects are multiplied on the mismatched line.

Let us address ourselves to the latter two effects. The actual solutions to the

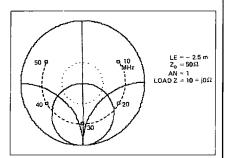


Fig. 1. This Smith Chart shows a 5:1 VSWR circle.

transmission line equations with real lossy transmission line is another order of magnitude more sophisticated and will not be tackled here. However, from some simpler considerations we can begin to make an estimate.

We can begin by considering point 2 above. Let us presume that we have 1,000 watts and that we have a lossless antenna coupler or transmitter tank circuit. On a matched 50 ohm termination, our hundred watts would require:





The POWER STATION is a 12v 7Amp/Hr gel-cell battery. It comes complete with a built in voltmeter, a wall charger and a cord for charging via automobiles. It powers most hand held radios at 5 watts for 2-4 weeks (depending upon how long winded one is). It will also run a VHF, UHF, QRP or

HF mobile radio, such as the Icom 706 at 100 watts. There are no hidden costs. All that is required is a mobile power cord or a HT cigarette lighter adapter.

The POWER STATION provides 12V from a cigarette lighter outlet and has two recessed terminals for hardwiring, A mini-phone jack with 3V, 6V, or 9V output can be used separately for CD player, Walkman, etc. The POWER STATION can be charged in an automobile in only 3 hours, or in the home in 8 hours. The charger will automatically shut off when the battery is completely charged. Therefore, The POWER STATION may be charged even when it has only been slightly discharged (unlike Ni-Cads that have memory). The charging circuit uses voltage sensing circuitry. Other brands are timed chargers, which always charge a battery a full cycle. If all that is needed is a partial charge, this damages a battery and shortens the life. The POWER STATION has a voltmeter that indicates the state of charge of the battery, not worthless idiot lights that declare "YOUR BATTERY IS NOW DEAD". The voltmeter can even be used to measure voltages of other sources.

Dealer Inquiries Invited

Send Check or M/O for Model 752 for \$49.95 + \$10.50 s/h. Include UPS-able address and tel. no. to:

THE HAM CONTACT, P.O. BOX 4025, DEPT. 73 Westminster, CA 92684 WWW.HAMCONTACT.COM

VISA

CA residents Add 7 3/4% Sales Tax. Canadian Residents Please Send U.S. Money Order & \$26,00 Shipping. If you wish for more information please send a SASE with 3 stamps to the above address. E-mail: 73@hamcontact.com INFO LINE: (714) 901-0573 FAX: (714) 901-0583, ORDERS ONLY (800) 933-HAM4.

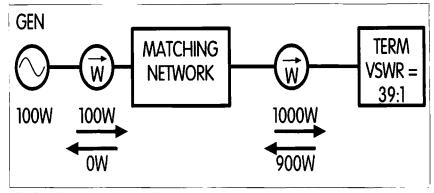


Fig. 2. Voltage multiplication by standing waves.

1.000 watts = (V*V)/50 = 223.61VRMS = 316.23 V peak

We saw that a 5:1 VSWR will give a peak resistance of 250 ohms. Then:

1,000 watts = (V*V)/250 = 500VRMS = 707 V peak

The voltage and current are both increased by the square root of the VSWR. At 1,000 watts input, the current is increased from 4.47 amperes to 10 amperes by the 5:1 VSWR.

The peak voltage is of interest since this is what causes arcing. Conversely, the current-induced breakdown is caused by thermal effects, so the RMS values are of interest.

In a case that can easily arise, a centerfed half-wave dipole cut for 80 meters becomes a centerfed full-wave dipole on 40 meters. This is actually a very effective antenna because it acts as two half-waves in phase, and has significantly higher gain than a half-

wave. The impedance at the center of this antenna on 40 meters is typically about 2,000 ohms. This is a VSWR of 40:1; the peak voltage for a kilowatt is multiplied up to 2,000 V peak, and the current to 28.27 amperes RMS. The VSWR has multiplied the voltage and current from levels that are easily handled on RG-58U cable and BNC connectors to values that will almost certainly destroy them. An open wire or ladderline of 300 or 400 ohms impedance could be used here. The VSWR and the losses are both lower.

To drive this point home a bit more, let us examine a case similar to the 80/40 meter dipole. In **Fig. 2** we see a generator, a directional wattmeter, a lossless matching network and another directional wattmeter, and a termination with a 39:1 VSWR. For a 39:1 VSWR, the reflection coefficient is 95%, which says that the forward power to backward power is in a 10:9 ratio. In order for the load to dissipate 100 watts, the forward power must be

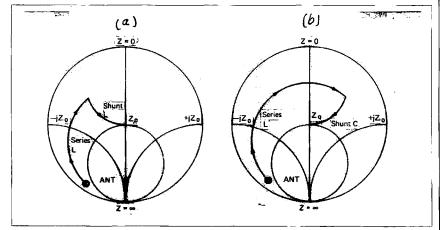


Fig. 3. Lumped parameter matching.
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1,000 watts and the backward power 900 watts.

The lossless matching network must turn the backward power around and add it in phase to the incoming 100 watts from the generator. This is a technique that is frequently used to test components for power handling when one does not have a source of RF equal to the power rating for which the component must be tested.

Losses

Considering a similar setup, let us assume that the transmission line has a loss of 1 dB for the length and frequency in use. A 1 dB loss means that only 79% of the power leaving the matching network reaches the load. With a 39:1 VSWR, 90% of that is reflected, and only 79% of the reflected power gets back to the matching network. That would amount to 0.79*0.9* 0.79 = 0.56. Instead of a VSWR of 39:1, the matching net would view a VSWR of 7:1. Without belaboring the point too much, it is easy to see that the VSWR also multiplies the losses in the line. For a realistic evaluation of the power loss, we would have to consider the losses in the matching network that will not be zero. If the line loss is 3 dB and the line is terminated in an open or a short circuit, voltage reflection coefficient at the line input is 0.5 and the VSWR is only 3:1. Fig. 19-5 in the Radio Amateur's Handbook, 1999 edition, gives additional line losses as a function of VSWR.

Lumped element matching

At HF frequencies, it is quite common to use lumped elements — that is, resistors, capacitors, and transformers — to match impedances.

Referring to Fig. 3(a), we see a rudimentary Smith Chart in impedance coordinates. We can always add a Yo circle to a Smith Chart with a compass. The circle passes through the Zo point and the Z=0 point. In the figure, the antenna is designated by a large surveyor's mark. It is situated in a point of lower than 50 ohms resistance and a rather large capacitive reactance. The situation is similar to the impedance

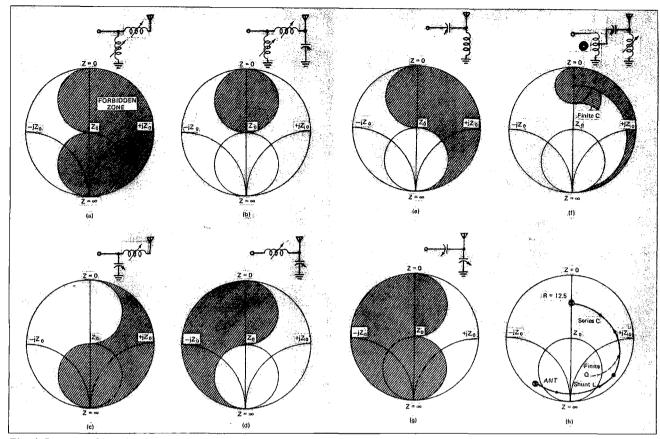


Fig. 4. Some matching circuits.

of an electrically small mobile whip — for example, a 12-foot whip at 7 MHz.

If we add a series inductance to the whip, the impedance point moves along a constant resistance line in the direction of less and less capacitive reactance. We keep adding inductive reactance in series until we reach the Yo line (probably 20 mmho, if the chart is Zo = 50 ohms). At this point, we add shunt inductance until the point impedance reaches the Yo (and Zo) point and the antenna is matched.

In Fig. 3(b), we add more series inductance until the antenna crosses the zero reactance line and meets the Yo curve on the inductive side d. In this case, shunt capacitance will bring the point in to a match.

Fig. 4 shows some matching circuits, including the areas on the Smith Chart where they cannot be used. For example, the circuit at Fig. 4(a) cannot be used in any of the shaded areas because the antenna is already inductive or the resistance cannot be moved to a matching line. In Fig. 4(b), the addition

of a shunt capacitor permits the swing of inductive data at the right (inductive) side over to the left (capacitive) side, where the two-inductor circuit of Fig. 3 could do the job.

Fig. 4(c) shows a forbidden region on the inductive side because the antenna is already too inductive. The inverse of this arrangement is in Fig. 4(d). It is noteworthy that the forbidden



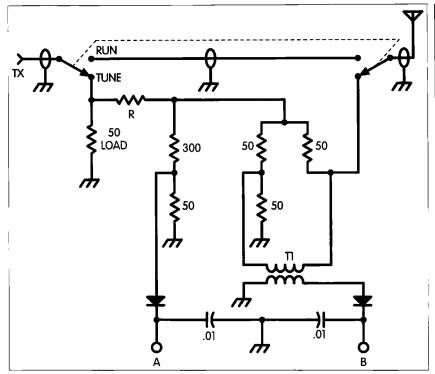


Fig. 5. Micro tuner.

regions form the "yin" and "yang" figures found in Chinese philosophy and literature.

Fig. 4(e) is useful for matching electrically small antennas; however, it may not handle an antenna that goes through the quarter-wave resonance at 37 + j0 ohms, which lies within the forbidden zone. This problem is corrected in Fig. 4(f) by the addition of a 4:1 impedance transformer. In this case, we match the antenna to 12.5 ohms and then step up to 50 ohms with an autotransformer.

The circuit of Fig. 4(g) is useful mainly for matching inductive antennas, such as loops.

Harking back to the circuit in Fig. 4(f), this is a very useful circuit that I have employed many times for matching mobile, marine, and aeronautical antennas. With the proper range of components, it will handle these antennas from 1.8 to 30 MHz. Fig. 4(h) shows the path. The shunt inductor takes the antenna over to the 12.5 ohm line on the inductive side, whereupon the series capacitor carries it up to the 12.5 + i0 point to be transformed to 50 ohms by the 2:1 ratio transformer. The limitation in matching range due

to finite capacitance is shown in (f), and the effect of a finite Q in the inductor is shown in (h). With electrically small antennas, the effect of the losses in the elements must be included in the design.

There are, of course, many other possible tuning networks, including "Tee" and "Pi" types, that can be solved using the Smith Chart techniques. In general, the lowest loss and broadest bandwidth networks will be those that move the load toward the match point most directly — that is, in the direction of decreasing VSWR.

Line transformers

One of the techniques used for impedance matching is the line transformer. We earlier observed that the resistance values on a mismatched line went from Zo/VSWR to Zo*VSWR. On the 50 ohm line, the 10 ohm resistor produced 10 ohms, and a quarterwave away, 250 ohms. This can be used to transform impedances. If we have a 10 ohm load and wish to transform it to 50 ohms, a line 1/4 wave long with a Zo equal to the geometric mean between the two will do the trick:

$$Z_0 = \sqrt{(50*10)} = 22.36$$
 ohms

This technique is very frequently used for microwave stripline and waveguide circuits, but it is used at HF only for the rare occasion when a line of the correct Zo happens to be available.

The micro tuner

With the previous discussion, we have shown a number of networks using variable elements to match various loads. In general, all of the elements must be of the proper value in order for an impedance match to be obtained. It can be time consuming and irritating to others to emit a carrier while searching for a tuned condition. My answer to this is what I refer to as a micro tuner, which reduces the emitted carrier to a few milliwatts, thereby minimizing the interference to others. It also serves as a protective device that prevents the transmitter from seeing any extreme mismatches which might damage it.

Fig. 5 shows the general arrangement. The transmitter feeds into a double pole double throw switch. For the 160 through 10 meter range I have used a small relay for this function. something with a rating of 120 V and a few amperes. The relay functions as a tune/operate switch.

In the tune position, the relay goes to the 50 ohm dummy load constructed in the first chapter. This load absorbs most of the power during tune-up and presents a stable load to the transmitter. preventing any damage.

The resistor labeled R taps off a few milliwatts for the bridge and the power sample. It should be selected based upon the power your transmitter produces during tuning.

The bridge resistors are quarter-watt carbon film types such as Tech America 900-0187; the 300 ohm resistor is a half-watt T.E.900-0366 or equivalent. The diodes are preferably germanium RF or switching types such as 1N3666; however, silicon 1N914 or 1N4146 types will also work. The germanium types have a lower forward drop and are more sensitive.

Continued on page 60

by Dave Ingram K4TWJ

The fascinating array of microphones in our cover photo is compliments of well-known audio guru Bob Heil K9EID. Although only samplings from Bob's extensive and historically significant collection, they represent over seven decades of radio broadcasting and communications. Whip out your pocket magnifier, scrutinize their authentic "used by notable personalities" battle scars if you like, and let's take a whiplash tour of the little delights.

tarting at the left top, the flat round mike Shock-mounted in a "four-edged star" spring arrangement is an ElectroVoice model 50. It was a hallmark mike at the beginning of the studio recording era, and it is affectionately called an "Al Jolson mike," as he was one of the first folks to use it in a talking movie or recording studio. Next on the right is a very notable RCA77 "Capsule mike." Below and to the left of the 77 (under the EV50) is the wellknown RCA44 "Diamond mike." Both the 77 and the 44 are ribbon or condenser mikes: They require phantom-powered external preamps for operation and exhibit outstanding audio quality. These mikes were quite popular in recording studios and big-time radio stations during the 1940s and early 1950s. Magnificent little critters, aren't they! The 77 is also nicknamed a "Letterman mike" or a "Larry King mike," as both entertainers use them as stage props (their onthe-air mikes are wireless lapel items).

Continuing on along the bottom row, the round mobile speaker-looking mike on the 44's right side is a genuine Turner U9S. It was widely used by newscasters of the 1930s and is also called the "Winston Churchill mike," as he was often photographed behind one. Look back through old QST and Radio News magazines, and you will also spot this delight in many amateur radio setups. Can you imagine refurbishing and retrofitting one of these gems with a Heil mike element today? Wow! Romance recaptured for sure! Roll over Beethoven and dig these mikes to use. Whew!

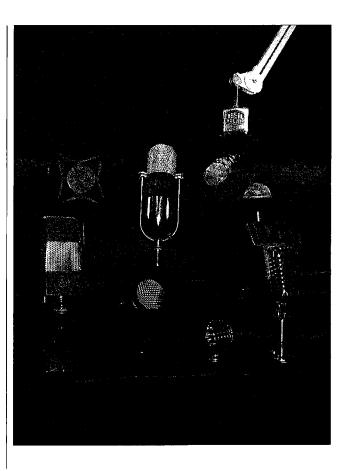
The little chrome-grilled mike beside the U9S is special in many ways. The original version was an Astatic JT30 "bullet" crystal mike. Bob Heil introduced a number of big-time entertainers, harmonica players, and blues singers to this unique sounding mike — The Grateful Dead, Bob Dylan, Jay Giles, "Magic Nick," and more. After the mike became famous (thanks to K9EID), Shure came out with an identical model called the 520DX — the "Green Bullet." Modern versions of the 520DX sport a vol-

ume control in place of their stand mounting hole. Harmonica players hold them in their hand. When adapted to a modern ham transceiver they exhibit a sort of "Wolfman Jack" sound.

The adjacent mike (lower right) is a legendary Shure 55S. This particular one was retired from KMOX, the CBS affiliate station in St. Louis that carried Bob's High Tech Heil program for the past 22 years. He discussed everything from consumer electronics to ham radio on the program. The Shure 55S, incidentally, was recently nicknamed the "Elvis mike" in honor of the king who used it often.

Positioned above the 55S is a classic Brush crystal microphone which was popular during the 60s. This treat was used in studios and amateur setups alike. Its mating "universal" stand supported desk and/ or handheld use.

Finally, the top right mike is Bob Heil's new and available right now GoldLine mike. It sits in its optional shock mount assembly, and it is a killer! The GoldLine mike is especially designed to glamorize any modern transceiver with dynamite sounding audio. This gem is also two microphones in a single case. By flipping a small switch on the mike's side, you can change it from an image-enhancing full bodied sound to a DX pileup penetrating sound on-the-spot. More details on this amazing new microphone are



included in my feature article, "The Quest for Super Sounding Audio," which starts on page 10.

Cover picture layout/design by Sandy Ingram WB4OEE; photo by Bob Heil K9EID.

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The DX Partyline Low Noise Wavecatcher

Here's a great noise reduction loop for SWLing.

The old maxim about necessity being the mother of invention is still true. While developing material for my monthly radio show entitled "Tech Talk with Dr. Rick" (which aired last year as a ten-minute segment on HCJB's "DX Partyline"), it became clear to me that not much has been published or devised to mitigate noise problems experienced by shortwave listeners. So I set about to design a very simple and inexpensive antenna that our listeners could build and experiment with. So enthusiastic was the response that we decided to have a "name that antenna contest," and publish a small construction booklet. Here are the details.

nce again a design based upon a square loop has come forth out of HCJB. Nearly everyone is familiar with the cubical quad antenna that was designed by HCJB's own Clarence Moore W9LZX in 1942. The uniform distribution of RF current around brother Moore's loop was the medicine needed to eliminate the problem of burning the ends off of the directional antennas used by HCJB. Many derivatives have come forth from that design, perhaps the most noteworthy within the past 25 years being the

"Quagi" antenna developed by Dr. Wayne Overbeck N6NB.

The uniform nature of current distribution of square loops also inspired Brian Beezley K6STI to develop a horizontal loop² that exploits this property to minimize, if not eliminate, sources of impulse noise that plague radio reception. For Brian, the need was to drastically reduce noise at 1.8 and 3.5 MHz for the benefit of radio

amateurs who enjoy "top band" DXing. What I have done is to optimize this design for use from 3 to 26 MHz for the benefit of the thousands of shortwave DXers out there who suffer from the impact of noise. This noise reduction loop is for you! And hats off to Clarence and Brian for the inspiration!!

The basic design of this type of noise reduction antenna is that of a

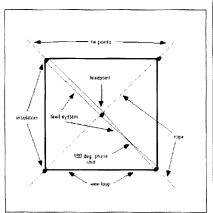


Fig. 1. Basic diagram of the noise reduction loop (attic configuration).

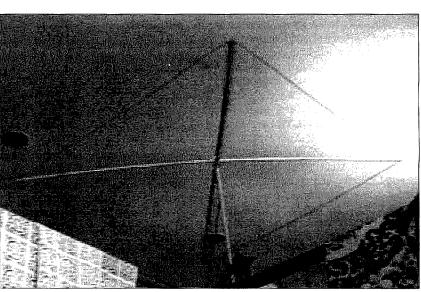


Photo A. Here is the low noise loop in the second floor loft of my home QTH.

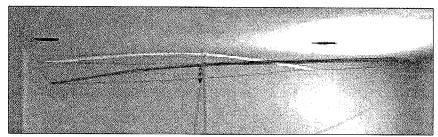


Photo B. Side view of the 5.7-foot loop.

square wire loop configured in a horizontal manner. Fig. 1 shows the basic layout of the antenna as it is viewed from the top. The loop is formed in two halves, with two of the corners fed through an open hole in a ceramic (or plastic) insulator. The other two corners are fastened at either ends of the same type of insulator, and connected at these points to the feedline, which forms the hypotenuse of the two right triangles that make up the loop.

This type of antenna is extremely lightweight, and may be used quite effectively in the attic of a wood-framed home. Fig. 1 shows each of the four insulators being tied off to a suitable mechanical fastener such as a ceiling joist. The addition of a rope orthogonal (at a right angle) to the feedline is necessary to keep the loop square when hung properly at all four points.

A fifth insulator is used as the point where the antenna is joined to feedline going to the receiver. Note in the drawing that for the antenna to operate properly, the two ends are fed 180 degrees out of phase by twisting the feeder at one end. The attic antenna works very well when 450-ohm ladder line is used as the feeder.

In order to determine an optimum size for the broad range of frequencies employed by shortwave broadcasters, I built two versions of this antenna, which you can see in Photos A and B. The first was optimized for higher frequencies of around 12 to 26 MHz, and the second was a compromise that covers the entire range from 3 to 26 MHz. In this case, I used 4-foot- and 5-footlong solid spreaders instead of just rope. This yielded loops that were approximately 5.7 feet and 7 feet square, respectively. It was my desire to make it possible for this antenna to be hung below a patio, or fastened to a mast outdoors, or even (against the esthetic objections of my wife) to be set it up in the loft of our house. I can't imagine why she would object. I think it is a true work of art.

The material I used is half-inch PVC irrigation pipe. It is one of the most inexpensive materials available. You might also want to use wooden dowel rod, bamboo, fiberglass tubing, or some other nonconductive material for your loop. PVC also has an additional advantage, as there are some ready-made fittings that can be purchased offthe-shelf that are

handy for joining the spreaders together, and at right angles as well. Take a close look at the photos in **Photos C** and **D**. I used two four-way junctions with a 3-inch piece of 1/2-inch PVC (now invisible) to join them together. I then threaded a small self-tapping screw into each joint to keep them from slipping apart, or twisting away from their 90-degree orientation.

Since some of you might not have ready access to 450-ohm ladderline or



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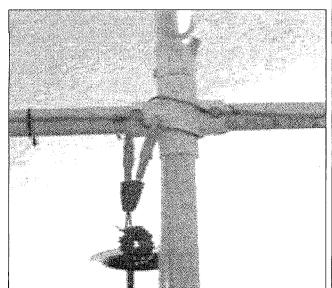


Photo C. Simple wire feed system tie points.

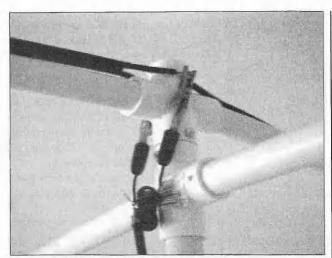


Photo D. 300-ohm feed system tie points.

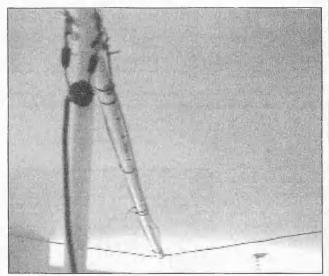


Photo E. Simple feed system.

300-ohm twinlead. I constructed the feeder of smaller loop out of wire - hence its name: "simple wire" feeder. Photos C through F show the difference in appearance and construction of the two feeder systems. I used 300-ohm twinlead on the larger loop to see if there was any significant degradation performance with the simple wire feeder. To my joy, there was not. As for the wire, just about anything will do, just so long as you can solder to it.

I mentioned on one of the Tech Talk segments that I built this antenna in less than an hour, so I expect you will have a similar experience, especially considering that I am all thumbs. Your construction time will vary, so here goes.

After joining the two spreader joints together, insert the four spreader elements into the joints. Make sure that the spreaders are mounted at right angles to one another. (A word to the wise: Check this *first*, before sinking the screws.) With the spreaders in place, the hypotenuses of the two loophalves for each antenna are 8 and 10 feet, respectively.

You may now prepare for the addition of the wire by drilling a small hole just large enough for the wire in the non-fed spreader ends as shown in Photo G. Be careful to cut enough wire to allow for each of the two triangles as well as the simple wire feeder, plus a little extra for good measure. (It is much easier to cut off the excess than it is to add more to a short end!) In the case of the smaller loop, this works out to a little less than 20 feet of wire (5.7 + 5.7 + 4 + 4 = 19.4)plus some extra). You may then feed the wire through the hole at the end of the spreader, and keep passing it through until you arrive at the midpoint of the wire.

Next, drill small holes in the "fed end" of the two remaining spreaders, and use tie-wraps to secure the wire to the end on the horizontal sides of the tubing, as shown in **Photo H**. You may then use additional tie-wraps to secure the wire to opposite sides of the spreaders, thus forming a crude "openwire" feeder for the antenna. You may also use fisherman's twine, string, or other materials to secure the wire to the spreader. However, I don't recommend using a conductive material such as wire, for obvious reasons.

Because I had elected to use the loop wire to also form the simple wire feeder, it is not possible to put a "twist" in one end to accomplish the 180-degree phase shift needed at each end of the feeder. Instead. I did the twist right at the feedpoint of the antenna. After sinking self-tapping screws into the spreader joint, copper wire is used to form the twist as shown in **Photos I** and **J**, with a sort of "under/over" attachment of the wire at opposites sides of the joint. The next step is

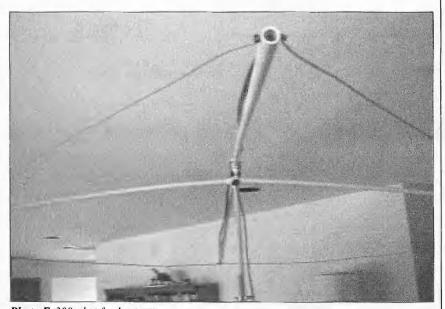


Photo F. 300-ohm feed system.32 73 Amateur Radio Today • March 2000

to cut and solder the loop wire to the pigtails that extend off the screws at opposite ends of the feedpoint you have just fashioned.

As for the larger loop, the decision to construct the feeder out of 300-ohm twinlead caused me to build the antenna slightly differently (you can use either method on either antenna). I used the same through-hole technique on the un-fed spreaders, but on the fed end of the other two spreaders, I sank self-tapping screws in the ends, as shown in Photo K. This allows you to use a lot less wire.

Fasten the wire to the screws along with the distant ends of the 300-ohm feeder, and solder them together. Photos C through F show you how to lay the twinlead along the upper spreader, and fasten it to self-tapping screws that are sunk into the midpoint at opposite sides of the upper center joint. Remember to take care that one feeder has the requisite "twist" in it to form the 180-degree phase shift. Here's a hint for you: If you want to use an ohmmeter to check to see if the phasing is correct, touch the leads of the meter to the opposite poles of the feedpoint. If you measure a short circuit, you did it right! If you measure an open circuit, it's back to work to get it right. I'll let you have some fun figuring that one out yourself.

Feeding the antenna

Hey, the antenna is built already. That was fast! Now comes the important part: hooking the antenna to the receiver. I measured the impedance of the antennas at the various shortwave bands and discovered that they were at or above 150 ohms in most cases. I had intended to use either 75- or 50-ohm coax to feed the antenna so as to maintain good noise isolation going into the shack. In order to get the antenna impedance a bit closer to 50 ohms on my favorite bands, I decided to put a 4:1 balun transformer at the feedpoint of the antenna. I did this to minimize mismatch losses in the coax that would degrade the performance of the antenna.

Fig. 2 and Table 1 show how the feedpoint impedance of the antenna varies from 3 to 26 MHz. These measurements were taken with a 4:1 balun (terminated with a 50-ohm load on its primary side) across the feedpoint of the loop. I chose to use a 4:1 balun as I had intended to use 50-ohm coax to feed the antenna, and wanted to keep the end points of the impedance excursions down to a manageable level.

I had originally built the balun when I constructed the smaller loop. Its impedances are a little higher. The impedance of the smaller loop does not drop off at the higher frequencies as much as the larger loop. As it turns out, the larger loop resonates at around 33 MHz, while the smaller loop resonates at around 45 MHz. However, the larger loop has some directional characteristics at the higher frequencies that can come in handy, depending upon your setup. Its larger aperture has a beneficial effect at the lower frequencies as well. I also got a nice peak right

Continued on page 34

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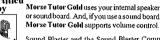
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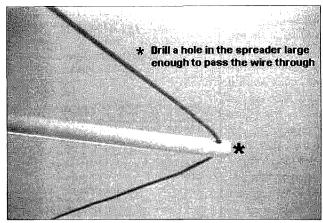


Photo G. Construction of the non-fed corner of the loop.

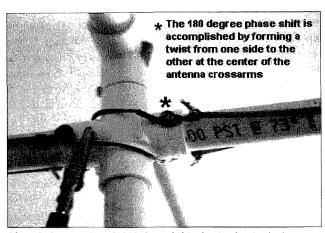


Photo 1. Construction of 180° phase shift in the simple wire feed system.

around 9745 and 12015 kHz, which transforms down to about 60 and 50 ohms, respectively. This is an acceptable untuned mismatch on my two favorite DX frequencies!

Here's how to make a simple 4:1 balun that will help to minimize impedance mismatches from 3 to 26 MHz. There are various ways of constructing a 4:1 balun, but I chose to build one similar to what is described on page 25-16 of the 1991 edition of the ARRL Antenna Book. Fig. 3 shows the drawings from that page. The construction of the balun is very simple. Start with an Amidon T-68 series powdered iron core with an inside diameter of 0.6 inches. Next, take some 24gauge plastic-coated wire and wind 10 turns on the core as shown in **Photo L**. then solder the ends as shown, leaving a pigtail at each end that could be connected to the feedpoint on the loop as well as the coax (see **Photo M**).

Since I was doing a lot of experimenting, I decided to put some clip leads on the ends of the high impedance side of the balun so that I could quickly connect and disconnect from the antenna in order to make measurements, and the like. I strongly recommend that you solder the pigtails directly to the feedpoint on the loop when you have finished your own experimenting.

Tuning the antenna

In Brian Beezley's article, and in a subsequent work by Ed Andress W6KUT³, it is suggested that to achieve peak performance, the loop be tuned in such a way that it becomes resonant on the band (and in the case of very high Q, the exact frequency) on which it will be used. This is entirely true. However, in the vast majority of SWL applications, and especially in the case where cost and complexity are

to be avoided, this is not practical. This would require a matching network for each of the shortwave bands all the way from 3 to 26 MHz. To those who are not constrained by cost and complexity I highly recommend this approach. Ed and Brian's articles provide excellent

insight into how this can be accomplished.

Fortunately, acceptable performance may be obtained by tuning the antenna remotely. This can be accomplished in either of two ways. The first way is with a simple antenna tuner. I tested this method with a couple of small tuners I had lying around. In technical terms, this method provides a conjugate match for the antenna and receiver by tuning (matching) the impedance discontinuity present at the receiver's end of the coax coming from the loop. In simple terms, it makes the antenna and receiver happy because they both see a 1:1 match of their characteristic impedance when looking into the coax.

However, this approach has a couple of disadvantages (but not terribly bad ones in a receive-only system). First, the antenna is nonresonant, so its efficiency is not optimum compared to the resonant case. Also, one of the fundamental characteristics of transmission lines is that they not only function as a waveguide for received signals, but also are complex impedance transformers. Consequently, in a remotely tuned system, the untuned impedances can vary greatly from the antenna to the receiver. Thus a higher loss component can be expected. Ah, but we can fix that with a preamp. More on that later as well.

The other approach, one suggested by the MFJ Corporation⁴, is to seriesresonate the whole circuit at the receiver's end with a simple LC network. The MFJ-956 does a reasonable

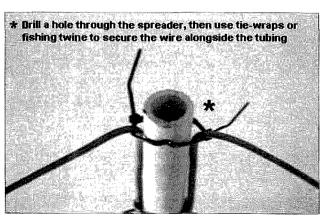


Photo H. End view of the transition from loop to simple wire feed system.

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Photo J. Bottom view of phase shift construction.

job at this. It is a simple circuit that has a 350 pF variable capacitor in series to select the band and tuning range that you desire. And it's inexpensive, too, costing less than \$50 U.S., if my memory serves me correctly (\$49.95, to be exact — ed.).

If you don't have one available to you, and build one can yourself, all you need to do is put a 350 pF variable capacitor in series

with a toroidal inductor (the same size and material used on the balun) that with several switched inductor values | has 30 or 40 turns of #30 enameled

magnet wire on it. You can experimentally choose several "taps" on the inductor, and

QRG	Antenna Z			
MHz	Magnitude	Angle		
3.0	72.0	71.0		
6.0	148.0	48.0 38.0		
7.4	180.0			
9.7	257.0	46.0		
12.0	188.0	25.0		
13.6	172.00	32.0		
15.0	150.0	37.0		
17.7	122.0	43.0		
21.5	92.0	54.0		
26.4	52.0	65.0		

Table 1. Plotted points on Fig. 2.

select them with a wafer switch to tune the desired band along with the variable capacitor (see Fig. 4).

This method also works quite well, but is rather sensitive to the impedance of the device it is feeding. It likes to

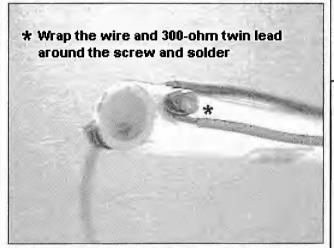


Photo K. Formation of the 300-ohm twinlead feeder.

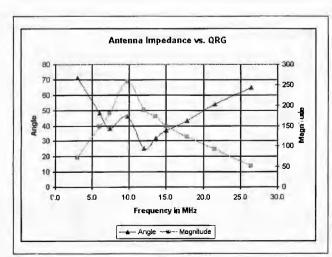


Fig. 2. Larger loop antenna impedance vs. frequency (see also Table 1).



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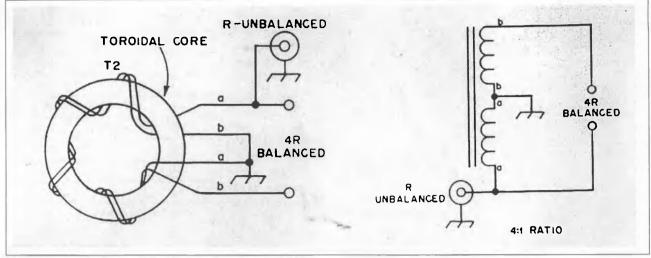


Fig. 3. Schematic diagrams of the 4:1 balun (courtesy ARRL).

see a high impedance of 50 ohms or greater, and that's where a small pream-

plifier comes in handy. This method also has the benefit of functioning as a rudi-

mentary filter for reducing or eliminating interference and desensitization that comes from nearby AM and FM broadcast stations. If you find that you cannot find a "peak" on one of the desired SW bands. try using a slightly longer or shorter coax jumper to, or from, the filter. Recall that in Fig. 2, the impedance of the larger loop is rather low at the

> upper and lower frequencies. The

> 4:1 balun makes

those impedances

even lower. A

tuner will usually

fix that problem, but if you only have a series-resonant circuit like this one, an additional coax jumper can often transform that impedmore manageable point on the Smith Chart.

The preamplifier

The advantage of using coaxial transmission line in this system is that it provides a reasonably good shield against noise that might be induced into the feed system. The disadvantage is that losses can be much greater in a nonresonant system like this one. Ladderline has much less loss, but you have to be much more careful to avoid induced interference.

Fortunately, a great deal of those losses can be compensated for with an effective preamplifier. There are many good designs that provide between 15 and 35 dB of gain. The amount of gain

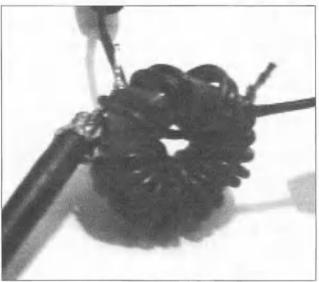


Photo L. Winding and construction of the 4:1 balun.

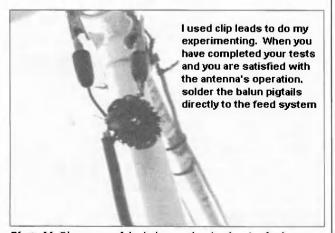
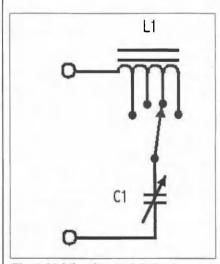


Photo M. Placement of the balun on the simple wire feed system. 36 73 Amateur Radio Today • March 2000



ance to a much | Fig. 4. Multiband series LC circuit.

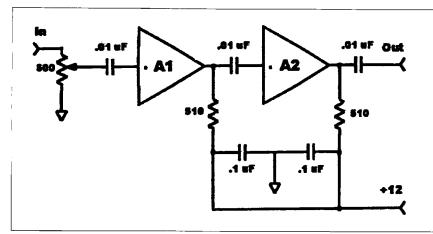


Fig. 5. Schematic of the 30 dB gain preamp.

required depends greatly on the configuration of your listening station. I had wonderful results with a little broadband U-310 amplifier (that's a field effect transistor, or FET) that I built. It gave me about 15 dB gain, which was all I needed as my receiver has a hot front end.

My friend. Dr. John Petrich W7HQJ, came up with an outstanding little preamplifier that is not only easy to build, but also provides upwards of 35 dB of gain — and that can come in handy with receivers that have a stingy front end. When I used it in conjunction with the series LC tuner and the loop indoors, I was logging stations from every corner of the globe. It didn't perform as well as my 86-footlong centerfed wire at 110 feet, but I didn't expect it to, either.

The basic building block of this amplifier is the MAR6 MMIC made by Mini Circuit Labs⁵. It is designed to operate within a 50-ohm system, which makes building this preamp a breeze. It should be noted that if only modest gain of 15 dB is desired, only one amplifier is used. This will eliminate the need for one each of the 0.1, 0.01 capacitors, and the 510-ohm resistor.

Because the MMICs are 50 ohms in and out, there's no need for fancy impedance transformation networks and the like on the circuit board. You can simply cut squares on the foil side of a PC board, and solder the handful of components in place. I'll leave that piece up to your imagination.

This leads me to some final comments

I'd like to make. As I said before, the job of reducing noise while covering such a broad range of frequencies, while providing a very simple, inexpensive solution, is a pretty tall order. The hours and hours I spent with this antenna have convinced me that it goes a long way to satisfy those goals. But I also hope that you will just have some fun building it and playing with it. It is

my sincere desire that you, and others, will come up with numerous ways of improving on its design and construction. I hope, too, that there will be some perfectionists out there who will come up with a version of this antenna that is truly elegant.

Just use your imagination, and have some fun. It's cheap! Oh, and if you think of anything that I overlooked and should be included in future extrapolations of this little antenna, please let me know, will you?

Notes

- 1. Overbeck, W. "The VHF Quagi." *QST*. April 1977, pp. 11-14.
- 2. Beezley, B. "A Receiving Antenna That Rejects Local Noise." *QST.* September 1995, pp. 33–36.
- 3. Andress, E. "A K6STI Low-Noise Receiving Antenna for 80 and 160 Meters." *QST*. Sep. 1995, pp. 37–41.
- 4. P.O. Box 494, Mississippi State MS 39762, USA; [http://www.mfjenter-prises.com].
- 5. P.O. Box 7128, Branson MO 65615, USA: (800) 654-7949.

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MAR 4

KNOXVILLE, TN The Shriners of Kerbela ARS will sponsor their annual Hamfest at Kerbela Temple, 315 Mimosa Ave., Knoxville TN, 8 a.m.-4 p.m. Admission is \$5. Indoor vendor tables are \$8 each plus admission of \$5. Setup Friday 4 p.m.-8 p.m.; and Saturday 5 a.m.-8 a.m. Overnight security will be provided. Talk-In on 144.83/145.43 or 146.52 simplex. Smoking indoors is permitted in designated area only. Contact Kerbela Amateur Radio Service, Kerbela Temple A.A.O.N.M.S., 315 Mimosa Ave. SE, Knoxville TN 37901.

MAR 5

NEW WESTMINSTER BC, CANADA The Burnaby ARC 14th Annual Fleamarket will be held at New Westminster Armouries, 6th St. and Queens Ave., New Westminster, BC. Open to sellers at 9 a.m., buyers 10 a.m.–2 p.m. Talkin on 145.35(-) or 442.85 VE7RBY. For information and table registration please call between 7 p.m and 9 p.m. P.T. Jim at (604) 946-9801; or Bob (604) 524-9177.

MAR 11

LONDONDERRY, NH The Interstate Repeater Society Annual Spring Flea Market will be held March 11th at the Londonderry NH Lions Club. Talk-In on 146.850. Tables \$10, buyers \$2. Email [Harold@neainc.com]; or call Paul at (603) 883-3308.

SCOTTSDALE, AZ The Scottsdale ARC Hamfest will be held March 11th, starting at 6 a.m., at Scottsdale Community College, 101 North-Exit Chaparral Rd., 9000 E. Chaparral Road, Scottsdale AZ. Talk-in on 147.18. Admission \$2; tables \$5. VE exams. Contact Roger Cahoon KB7ZWI, 8501 E. Edward, Scottsdale AZ 85250. Tel. (480) 948-1824; mobile (602) 725-7256; Fax (602) 943-7651. E-mail [wmgraceco@msn.com] c/o Roger Cahoon.

WEST FARGO, ND The Red River Radio amateurs will host their annual Hamfest and Computer Fair on Saturday, March 11th. The event will start at 8 a.m. and run until 3 p.m. at the Red River Valley Fairgrounds in West Fargo. Talk-In on 146.76(-). Ham radio and computer gear will be sold at the flea market and some commercial vendors will be present. VE exams and seminars will also be featured. Admission \$5 in advance, \$6 at the door. Tables

\$8 each; \$25 for commercial vendors (with AC power). All ground-level access with Friday night drive-in unloading. For more info, visit the Web at [http://www.rrra.org]; or call Mark Kerkvliet at (701) 282-4716.

MAR 12

YORK, PA York County Area Vocational-Technical School will present "Springfest Y2K," Sunday, Mar. 12th, starting at 8 a.m. Tailgating and setup at 6 a.m. Directions: I-83 to Exit 6; south to 1st light; left into school. Talk-in on 146.97(-). Admission \$5, under 12 years old free. Tables \$20; contact Richard Goodman WA3USG, Springfest Hotline (717) 697-2490; or E-mail [Yorkfest@aol.com]. VE exams. Preregister. Contact Virginia Moore N3LZS, (717) 252-1694. Bring copies and certificates. Send payments and requests to Keystone VHF.Club, P.O. Box 7462, York PA 17404. Visit the VocTech Web site at [http://members.aoi.com/yorkfest].

MAR 18

MARIETTA, GA The Kennehoochee ARC's 47th Hamfest will be held Saturday, March 18th, 8:30 a.m.-3 p.m., at Jim Miller Park. From I-75 at Windy Hill Rd., go west for approx, 5 miles to Austell Rd. Take a left, go 1/4 miles to Callaway Rd.; take a right on to Callaway Rd., go 3/4 mile. The hamfest is on the right. Talkin on 146.88(-). Setup Friday 1 p.m.-6:30 p.m. and Saturday 6:30 a.m.-8:30 a.m. Admission \$5 at the gate. Children under 12 years free with an adult, 8 ft, tables \$20 inside A or B buildings. Outside space 10 ft. x 10 ft., \$10. Outside covered 10 ft. x 10 ft. space \$15. Electricity \$10 per vendor. Free parking. VE exams will be conducted at the First United Methodist Church, Saturday, starting at 9 a.m. Please send SASE with orders to Charles Golsen N4TZM, 5580 Lake Forrest Dr., Atlanta GA 30342, tel. (404) 252-3303, E-mail [cgolsen@atlanta.com]; or Rubens Fiuza Lima P.T2RFL, 5064 Ravenwood Dr., Marietta GA 30066; tel. (770) 928-7038. E-mail [rubens@ mindspring.com]. Please, no phone calls after 9 p.m. ET.

MAR 18-19

MIDLAND, TX The Midland ARC will hold their annual St. Patrick's Day Hamfest 8 a.m.-5 p.m. Saturday, March 18th, and 8 a.m.-2 p.m. Sunday, March 19th, at the Midland County Exhibit Building. Some of the many features

include a huge inside flea market, dealers, large tailgate area, T-hunts, and a full service concession stand with hot meals. VE exams will be given at 1 p.m. on Saturday. Preregistration \$7, \$8 at the door. Tables are \$12 each for the first four and \$17 each for each additional table over four. For more info contact the Midland ARC, P.O. Box 4401, Midland TX 79704; or Larry Nix N5TQU by E-mail at [oilman@lx.net]. You can view a hamfest flyer on-line and download a registration form at [http://www.w5qqq.org].

MAR 19

JEFFERSON, WI The Tri-County ARC will present "Hamfest Y2K" Sunday, Mar. 19th, at Jefferson County Fairgrounds Activity Center, Hwy. 18 West, in Jefferson WI. Talk-in on the 145.49 rptr. The event will run 8 a.m.—2 p.m. Vendors will be admitted at 7 a.m. Vendorsonly parking will be provided for unloading. Admission \$4. 8 ft. table space at \$6 each. Plate lunches and beverages will be provided by Jefferson County 4-H. VE exams will be available. For additional info contact TCARC, 413 S. Main St., Fort Atkinson WI 53538. Tel. (920) 563-8740 evenings; Fax (920) 563-9551; E-mail [tricountyarc@globaldialog.com].

MAUMEE, OH The Toledo Mobile Radio Assn. (TMRA) will hold their 45th Annual Hamfest/Computer Fair, 8 a.m.-2 p.m. at the Lucas County Recreation Center, 2901 Key St., Maumee OH. For details, send SASE to Paul Hanslik N8XDB, P.O. Box 273, Toledo OH 43697-0273. Tel. (419) 243-3836.

STERLING, IL The Sterling-Rock Falls ARS 40th Annual Hamfest will be held at the Sterling High School Fieldhouse, 1608 4th Ave. Talk-in on 146.25/.85. Electronic, radio, computer, and hobby items will be featured at the large indoor flea market. Free parking, including areas to accommodate self-contained campers and mobile homes. Tickets \$3 in advance, \$4 at the door. Tables \$5 each without electricity. Tables with electricity are \$6 each. Bring your own cord. Setup Saturday 6 p.m.-9 p.m., and Sunday beginning at 6 a.m. Doors open to the public at 7:30 a.m. Sunday. Use only the North doors on Miller St. Vendors use West Entrance. Public use East Entrance. For advance tickets or tables, contact Lloyd Sherman KB9AP.W. Sterling-Rock Falls ARS, P.O. Box 521, Sterling IL 61081-0521; or call (815) 336-2434. E-mail [Isherman@essexl.com]. Advance ticket

Continued on page 60

VHF and Above Operation

C. L. Houghton WB6iGP San Diego Microwave Group 6345 Badger Lake Ave. San Diego CA 92119 [clhough@pacbell.net]

Noise Figure Meters: Getting the System to Work

Last month, I described the new test bench noise figure meter that I had purchased at a local swap meet. While it is a very special and quality piece of test equipment for the work bench, it did not come "ready-to-work out of the box," as a new device would be. Here, let's look at my efforts to put this noise figure meter back into service.

C crounged from the leftovers of commer-Scial operations, many pieces of test equipment that become orphans are auctioned off, or, no longer being required, are frequently separated from accessories that make a test set a complete functioning unit. Cords, probes, and even AC cords, along with special external devices normally part of these devices, become tossed into other boxes and sold when unintentionally separated from their main unit.

Such was the problem with my Ailtech 7514 noise figure meter. Its external parts missing included the manual, an external noise head, and a 30 MHz preamplifier with a very special connector to mate with the front of the NF meter to provide power to the external noise head. I will never figure out this connector! Ordering one to retain the unit in unmodified condition was a shock, as the remote preamp connector plug cost over \$30, not to mention shipping costs. All this connector does is to feed ground and +40 and +20 volts DC to external regulators in the remote 30 MHz preamp used with the system. Wow, what a price shock! Needless to say, I did not order one, but rather went to Radio Shack, where for just less than \$3 (tax included) I purchased a 4pin standard mike connector plug and panel jack.

I mounted the new jack on the rear panel, drilled a hole, and used an old 7-pin miniature tube-type socket chassis punch to knock out a large hole so that I did not have to file the hole and produce metal chaff inside the NF meter. Normally, the preamp would use a positive DC voltage, but the one I selected for my use from I to 12 GHz was a positive ground preamp for 70 MHz. Junk box innovation always saves hard-earned money.

This special negative supply preamp just happened to be in the junk box and functioned well. A more conventional preamp with positive DC power requirements could have been used just as well here. I tried other preamps from my junk box, but this positive ground 70 MHz unit performed best, so it was converted to 30 MHz by adding a few capacitors and retuning existing inductors on the preamp.

I was about to construct a positive ground DC source inside the chassis when I got a stroke of luck. I obtained a copy of the manual and found a negative 20 volt supply already inside the NF meter, in addition to the 40 and 20 volt positive supplies. Looking over the manual showed an option #09 that provided internal circuitry for multiband

mixing at additional frequencies vs. the simpler one frequency IF 30 MHz that I had. I determined from the schematic that the load on the -20 volt supply without the circuitry that I did not have was beefy enough to support my external negative DC power requirements for my modified 70 MHz to now 30 MHz preamp.

With this modification in hand. I was ready to attempt operation with the noise head that I located in New York through Bruce N2LIV. Got to thank Bruce for making the noise head available, as without the AIL-7616 noise head that I obtained from him. I would have had to construct a home-built one. That would have worked, but would have had many calibration problems. Given more time to experiment, I will describe construction of home-built noise heads in a later column to help others put a unit of their own construction together.

The system, now nearing completion with this new noise head and modified preamp, started to get my emotions going. It was quite exciting anticipating the first system test of the noise figure meter, as I had wanted a quality test set for a very long time. Yes, I had had an earlier noise figure meter

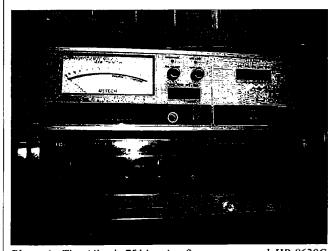


Photo A. The Ailtech 7514 noise figure meter and HP-8620C sweep oscillator are used with mixer as local oscillator for making noise figure measurements at microwave frequencies from 5-10 GHz.

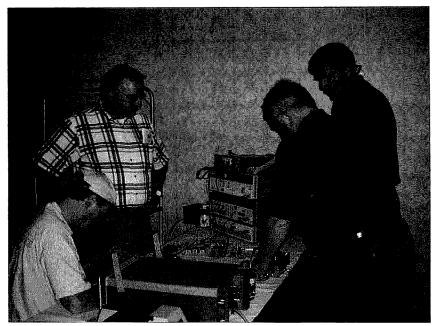


Photo B. Here's the noise figure measurement table that was part of the Microwave Update '99 conference in Plano TX.

in operation, but it was designed for less sensitive systems and would not function well below the 2 to 3 dB noise figure ranges. This unit was the Saunders NF meter — the Ailtech 7514 NF meter would be quite an improvement should it perform as expected.

Let's take a look at just what the Ailtech 7514 system constitutes with my new 7616 noise head. The frequency range of the noise head normally sets the range of coverage

within which the noise source is calibrated. To test over the frequency range of the AIL 7616 noise head, all that is required is the noise head, a 30 MHz preamp with about 20 dB of gain and a microwave broadband mixer, and a local oscillator. The local oscillator can be anything that will produce a CW signal in the microwave frequency range required and produce enough power output for injection to a mixer allowing good

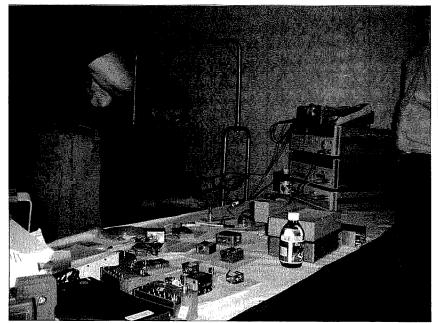


Photo C. Closer shot of preamps and other devices waiting to be tested at Plano on Oct. 23, 1999.

In the above test, I was using a frequency of 10,368 MHz. I repeated the measurement over the range of the sweeper from 2 to 12

GHz, using the sweeper in a CW mode point

mixer conversion. LO generator output power should be in the neighborhood of +7 to +10 dB. Usually this is maximum output of most signal generators. Be careful of some sweep oscillators, as they can be capable of greater output and need to be checked prior to use lest you might overpower a mixer and turn it into a doorstop by letting the smoke out. Either a CW signal generator or sweep oscillator in CW mode can be used - just be certain of its output capability and don't overpower your mixer. Usually, for most low level mixers +7 to 8 dB is all that is needed.

Here is the setup that I used. The parts that I used are not specific, as other devices will function well. The parts I used reflect what I had in my junk box. I had an MD-80 mixer with SMA coaxial connectors that covered 1 GHz to 18 GHz and on the bench an HP-8620 sweeper with a 86290C plugin that provided RF signals over 2 to 18 GHz. The sweeper in CW mode became my LO injection at the desired test frequency.

The preamp at 30 MHz was connected to the IF port on the mixer, and the noise head connected to the RF port of the mixer. Calibrating the system is quite easy with the Ailtech 7514 NF meter. All that needs to be known is the noise power of the noise head. The power is stamped on the side of the 7616 noise head as 15 dB ENR (±1 dB over 1 to 12.4 GHz). With the above calibration (ENR power) and coaxial connections made and power applied, turn on the sweeper sig gen LO and hit cal on the NF meter.

Set the noise power stamped on the noise head (15 dB ENR) to the 15 dB ENR mark on the meter and then hit auto. Now you read the noise figure directly on the meter. In my configuration as shown above with the noise head, mixer, and LO power from the sweeper connections, I read on the NF meter 6 dB. What this 6 dB represents from the noise figure meter is actually, in this setup, very near actual conversion loss of the mixer.

The system is now ready for an unknown component, be it a microwave preamp at the frequency of test, or whatever. The NF meter is ready to test devices, allowing retuning to improve performance sensitivity by setting for lowest noise figure. Here, gain does not reflect maximum sensitivity but, rather, what noise figure your preamp has does. The lowest or least number such as 0.45 dB indicates a much more sensitive device than 1.2 dB. The entire game here is having a meter that allows you to adjust your device at frequency for best (lowest) noise figure.

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frequency at several spot frequencies, and the results were very close to the 6 dB reading over frequency. I suspect wobbles in the reading were due to noise calibrations in the noise head, with some being due to the mixer and connections. All in all, the setup calibration was quite good and, to say the least, I was quite pleased.

To put the NF meter in operation testing preamps for each of our microwave bands from 1 to 12 GHz, all that is needed is to place the preamp under test between the noise head output and the mixer RF port and repeat the above test calibration. Set the dB ENR in Cal and press auto to read the new noise figure readings. On a test 10 GHz preamp that was tested at Microwave Update '99 in Plano TX, it measured with a 2.17 dB noise figure. On my setup, it measured 2.2 dB NF. I was clicking my heels, as now I could work on amps from 1296 to 10 GHz easily with this setup. Now, could it work at 450 MHz and 2 meters? 450 MHz would be interesting, but 2 meters would be even more so. Remember that the noise head used is only calibrated over 1 GHz to 12 GHz, and operation at 450 MHz or even 144 MHz is quite out of calibration ranges.

By being able to use 2 meters, a converter could be constructed for conversion of microwave converters to translate the 144 MHz IF to 28/30 MHz IF frequency that the noise figure meter requires. This converter means that complete RF transverters can be tested from RF input to IF output, which is 144 to 145 MHz normally in equipment we construct here in the San Diego Microwave Group. 450 MHz IF converters could be used as well: however, most of our equipment uses 144 MHz as the system IF because 2 meter multimode radios were more easily obtained than those for 450 MHz.

Back to the converter issue for 450 MHz. I had a Lunar Electronics RF converter for 432 MHz mode J Oscar converter to 28 MHz and gave it a try. Connecting the noise head to RF input and the IF output to the IF input on the NF meter, an external oscillator was not required, as the converter had an internal crystal oscillator providing the mixing LO for 432 minus crystal LO = 28MHz IF. Turning the system on, calibrating the same for 15 dB ENR, and hitting auto showed 4 dB NF. Placing an FET preamp between the noise head and the converter and repeating the above test reduced the noise figure to 0.7 dB NF, a great improvement, and showed the system to function well even below its normal calibration of the noise head.

Now to construct a working 144 MHz converter to make my requirement complete. I had a working 116 MHz LO already

constructed and used a 144 MHz bandpass filter, but wanted to use a positive supply to power the LO and IF preamp for this application rather than mix power supplies inside and outside of the NF meter. I went through the design stage and used a wideband HP bench 20 or 40 dB amp and gave it a try. Well, this failed right off the bat. The amp, while it did give gain as marked, produced so much internal noise that the noise meter could not tell when the noise head was connected. Further attempts at using MMIC amps — even band-limited to below 100 MHz - showed the same results: The noise meter locked up on internal noise being generated in the MMIC or because of other contributing factors not explored. In short, it did not function.

I thought I was trying to put too much gain in the system to overcome differences in the noise power, as the noise head is only rated to 1 GHz, and here we are trying to use it at 144 MHz. Well, that might be part of the problem, but all I was concerned with was trying to make a converter for 144 to 28 MHz function. Finally, I put a low noise 10 meter U-310 JFET preamp in the mixer system and tried it. No lockup on the NF meter. Still needed a little more system gain in the converter. I then used a 15 dB gain 144 MHz FET preamp and this functioned well.

The noise figure measured 7 dB. I am sure it's better than this, but the system worked. Remember, the noise head being used was only rated to 1 GHz, and we were trying to use it at 144 MHz — way out of calibration range. I call the 7 dB reading greatly suspect. It did not matter what the converter noise figure was, as it was to be a part of a much larger scheme using microwave converters and using the 144 MHz converter on the IF output to connect to the NF meter 30 MHz IF input. Whew, what an exercise in operations and system test!

Was the exercise worth all the aggravation in making the barebones AIL-7514 NF meter function by constructing all the needed external equipment? Oh, you can bet on it for sure. After going through all this effort, I would be a real unhappy camper if I should misstep and drop or damage the noise head. It is called in this hobby "unobtanium." When you are lucky enough to have one, protect it. Do not key your transmitter into it, as it will give up its smoke, and that material, once released from its container, can never be put back. Just use caution and be careful. Remember, you can measure a dozen times, but can only cut once.

Why did I describe this effort in detail? Well, to describe all the steps we go through to put something together hopefully will

assist you in a methodical manner to put a similar setup together. Be it an Ailtech meter or some other one, the principles are all the same. The chase to put together an orphaned test set can involve quite a quest in looking for components cables and manuals. The most important asset to mention is all the assistance you can obtain from others. It's this sharing of information that is so necessary to our repair effort, which could not have been pulled off without this assistance. The Internet was the vehicle that played the major role in searching for information and material. It provided for locating a manual, and the search for the manual turned up a noise head. That's because there are sharing amateurs who take the time to read questions on amateur-related reflectors, great sharing of information forums.

In my case, the questions in looking for information and manuals netted both a noise head and a manual, which I was quite happy to pay for. Additionally, while the manual did splendid on the noise meter, it left out much on the external preamp (probably a separate manual), and that left me with further questions, as you can see from my experiments in this article. There were many other E-mail replies concerning how others interfaced their meters. These replies all helped to formulate my system into what it is today. I am not a purist and thus will not worry about the absolute calibration of my system. While it is nice to know exactly what the real number is, it is good enough for me to have eyes that allow improvement with a small uncertainty and to know how to make noticeable improvements with this test set.

In review

Noise figure test equipment can give you a handle on performing a meaningful test, and allow you to tweak the circuit and gain improvements to any system under test by using a meter such as the one I have. It allows you to adjust your system or preamps to a lower number, which equates to better sensitivity. A higher noise figure number means poorer sensitivity; lower numbers mean better sensitivity. Hopefully, you will be able to locate a meter for your own use. In another column I will, when tests are complete, describe a simple noise head you can use on your systems to make improvements to your equipment. It will be a simple unit to construct, but one that if all design plans go well will give you an effective test device for the work bench.

I hope you found this example covering my involvement with noise figure meters to be of interest, and I also hope that you can put it to use in testing your own microwave or UHF/VHF systems.

Andy MacAllister W5ACM 14714 Knights Way Drive Houston TX 77083-5640

Contacting AO-27

Last time, we investigated information about AMRAD-OSCAR-27. This month, we'll get down to the basics of making contacts via this crossband repeater in the sky. With a typical dual-band handie-talkie and the details in this column, you can get on the air and make contacts NOW. If you haven't yet listened to and made contacts through an amateur radio satellite, it's time to start.

our Earth station: AMRAD-OSCAR-27 (AO-27) is a single-channel crossband FM repeater. The input is on 145.850 MHz. The downlink is on 436.797 MHz. Thus, to work the satellite, you will need to transmit on two meters and receive on 70 cm. A dual-band 2m/70cm HT that can transmit on one band while simultaneously receiving on the other is all you need. I use an older Alinco DJ-580T and the larger 12-V battery pack to get the most possible output on two meters; five watts. While my radio required some simple hardware modifications to operate in the 430-440 range, most new HTs are ready to go over the whole U.S. 70cm band, right out of the box.

Your satellite antenna

I have four dual-band antennas for my HT. All use BNC-type antenna connectors.

The short stock "rubber duck" that came with the Alinco DJ-580T is good for local communications and repeaters, but it

just doesn't have enough capture area to receive AO-27 or transmit to the satellite. Several companies make longer antennas that can be used for hamsat communications. My first was the Diamond RH77B. It's 15 inches long, and has been used for dozens of AO-27 contacts while I have been out on camping trips and cruising the Caribbean. A similar but

less expensive antenna is the MFJ-1717. It measures 16 inches long and looks like it came from the same manufacturer. You will like it.

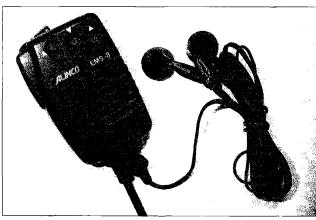


Photo B. The Alinco EMS-8 speaker/mike and earbud head-phones ready for AO-27.



Photo A. The Alinco DJ-580 set to go for AO-27 operation.



Photo C. The Mirage dual-band power amplifier can make a difference for mobile or home operation.

My newest favorite for satellite work is the MFJ-1712. It is a telescopic dual-bander, providing a 1/4 wave whip on two meters and a 5/8 wave whip on 70cm. When collapsed, it measures 7.25 inches. When fully extended, it is 19.25 inches. Unlike the other antennas, it is rigid and a bit longer when fully extended. When collapsed, the length is identical to that of the HT with the larger battery pack. It fits well in the same inexpensive camera case that I use to transport the HT, spare batteries, and other accessories.

Your accessories

Yes, you can use a stock dual-bander to make satellite contacts, but due to the full duplex nature of the crossband operation. it's not convenient or easy. Two items make a big difference: a speaker/mike, and an earphone or earbud headphones.

The speaker/mike allows you to move the HT around for best reception without making your head go through the same gyrations. The antennas on the satellite are changing their apparent polarization with respect to you during a pass. To get the best reception, and uplink, it is necessary to orient your HT antenna for the clearest signal. It becomes second nature after you have done it once.

The earphone or earbud headphones prevent feedback and help when signals fade. On most HTs, the built-in mike is very close to the built-in speaker. For crossband repeater work, feedback is the result. You won't like it, and the other satellite operators

For a campout or trip where extra gear is a problem, the mike and phones are all you will need. If you are working from a car, a small dual-band amplifier can help, but antenna orientation is a problem. Most mobile whips are mag-mounts and hard to move around for best satellite reception, but it can be done and provides another option. Maha and Mirage have some nice amplifiers that can provide some extra power to help during crowded conditions on the satellite.

Your tracking data

Several satellite tracking programs had problems after the first of the year. The data provided in Table 1 was derived from a Y2K-compliant version of Silicon Solutions GrafTrack Rev. 4.01. The data from the program has been trimmed down to provide information about the best single pass per day for AO-27 as seen from Boston MA. Houston TX, and Los Angeles CA.

Pick a location that has a longitude similar to yours. For example, if you live in San Francisco. use the Los Angeles data. On | Table 1. March 2000 tracking data for AO-27.

March 1st, orbit 33514 will be at the Time of Closest Approach (TCA) at 17:23 UTC or 09:23 PST for Los Angeles. AO-27 will be at 50 degrees elevation to the east. For an observer in San Francisco, this TCA will occur a few minutes earlier.

You can hear the satellite about seven minutes before and after TCA. All orbits are descending. That means that the satellite is traveling from the north to the south.

Continued on page 60

		Boston I	MA	Houston TX			Los Angeles CA		
March	TCA	El+Az	Orbit	TCA EI+Az		Orbit	TCA	EI+A2	Orbit
01	1538	32W	33513	1543	43E	33513	1723	50E	33514
02	1511	5 5 W	33527	1655	32W	33528	1835	30W	33529
03	1444	85E	33541	1628	62W	33542	1808	56W	33543
04	1417	48E	33555	1601	68E	33556	1741	78E	33557
05	15 2 9	37W	33570	1534	34E	33570	1714	40E	33571
06	1502	65W	33584	1646	39W	33585	1826	36W	33586
07	1435	72E	33598	1619	76W	33599	1759	69W	33600
08	1408	40E	33612	1552	55E	33613	1732	63E	33614
09	1520	45W	33627	1525	28E	33627	1705	33E	33628
10	1453	78W	33641	1638	48W	33642	1817	44W	33643
11	1426	59E	33655	1610	86E	33656	1750	84W	33657
12	1538	31W	3367 0	1543	44E	33670	1723	51E	33671
13	1511	53 W	33684	1656	31W	33685	1835	29W	33686
14	1444	87E	33698	1629	60W	33699	1808	54 W	33700
15	1417	49E	33712	1601	70E	33713	1741	79E	33714
16	1530	37W	33727	1534	35E	33727	1714	41E	33728
17	1503	64W	33741	1647	38W	33742	1826	36W	33743
18	1435	73E	33755	1620	75W	33756	1759	67W	33757
19	1408	41E	33769	1552	56E	33770	1732	65E	33771
20	1521	44W	33784	1525	28E	33784	1705	34E	33785
21	1454	77W	33798	1638	47W	33799	1817	43W	33800
22	1426	61E	33812	1611	88E	33813	1750	82W	33814
23	1359	34E	33826	1543	45E	33827	1723	52E	33828
24	1512	52W	33841	1656	30W	33842	1835	2 9W	33843
25	1445	88E	33855	1629	59 W	33856	1808	53W	33857
26	1417	50E	33869	1602	72E	33870	1741	81E	33871
27	1530	36W	33884	1534	36E	33884	1714	42E	33885
28	1503	63W	33898	1647	37W	33899	1826	35W	33900
29	1435	74E	33912	1620	73W	33913	1759	66W	33914
30	1408	41E	33926	1553	57E	33927	1732	66E	33928
31	1521	43W	33941	1525	29E	33942	1705	34E	33942

NEUER SAY DIE

continued from page 44

50:50. No, I've deprived myself of this commercial extravaganza, one which would exhaust even my fast forward patience. Hmm. I'll have to start timing some of the commercial breaks. Some go on and on (and on) with ads for food products no one should ever buy, and endless car ads, with an occasional program break.

Schools

A recent *Newsweek* article cited the statistics confirming "that what you earn depends on what you learn." Yet, here we are with our public schools providing less and less learning compared to other countries, as proven through international tests, and even as compared with previous generations.

But what can parents do? Home schooling often does a wonderful job of educating children, but that means that one parent has to be dedicated to it, and in today's world it takes the incomes from two wage earners to make ends meet. Sure, there are some private schools bucking the trend, but they're expensive, and often difficult for the kids to get into.

What about improving the public schools? Over the dead bodies of the National Education Association union leaders. who seem dedicated to making sure that as many teachers as possible have as high wages as possible, with no regard whatever to their ability to teach. I wish I could get you to read some of the books I've found which explain in detail how bad our schools have gotten, and why. They're reviewed in my past editorials and in my Secret Guide to Wisdom. Oh, well, I can lead you to the water, but I can't get most people to actually drink.

One holdover from the 19th century is the firmly implanted idea in most teacher's minds that forcing their students to memorize facts in order to pass a test is "teaching."

Getting kids to understand new concepts is teaching, not quickly forgotten stuff memorized to pass a test.

I went through K-12 and college, but I sure didn't emerge educated. I didn't understand squat. Oh, I did get a superb electronic education, courtesy of the U.S. Navy, with no thanks whatever to my college EE course. WWII came along and the draft board insisted that I would be of much more value as cannon fodder than wasting my time in college passing tests of my short-term memory. I opted for depth charge fodder and spent the war aboard the USS Drum SS-228, which you'll find on display in Mobile AL, complete with the flags painted on the conning tower for the Japanese ships we sunk. It was a bunch.

I'm now well educated, with no thanks to the K-12 schools I attended or to my four years in college. I'm self-educated. And this is essentially what the Sudbury Valley School in Framingham MA is permitting its students to do. I do think they should bring in people like me to open the doors of curiosity for their kids so they'd get even more excited about educating themselves.

I've talked with a lot of college professors as I've gone around giving lectures on entrepreneurialism at schools such as Yale, Babson College, Boston University, Rensselaer, Case-Western, and so on. Few (almost none) have been well educated, from my viewpoint. "Well, I don't know anything about that," is the answer the minute I get out of their dedicated field.

More money is not going to improve our public schools. Higher paid teachers won't help either. Nor will having more teachers. All of these "fixes" have been tried, over and over, and none have improved kids' test scores. More and higher paid administrators hasn't helped either, though this approach has been tried endlessly.

As teaching via DVDs becomes available, parents will finally have an alternative to the public school dumbing down brain grinder. Worse, as has been chronicled in many books, the concentrated efforts of the public schools to counter parental teaching and brainwash the kids with socialist ideologies needs to be stopped.

Can kids learn through self-education, even in their early years? Of course they can! Kids love to learn. They eat it up. That's what they've been doing ever since they were born. They've been exploring and learning. As soon as they can talk, they're an incredible nuisance, forever asking "why?" That's a major nuisance, because many parents don't know why. Kids need to be stimulated, not bored.

Some entrepreneur or school is going to start making grammar school subjects available on DVD, and we'll soon see the rise of a business that will eclipse Microsoft — and will change the world.

Fuzzy Laws

Maybe you've wondered why our courts (read: judges) more and more are making the laws. The reason is simple, the obfuscating career politicians you have been electing and then re-electing have been passing fuzzy laws which then are invitations to litigation. By avoiding specifics, they avoid making people angry.

Gee, what a surprise, considering that most of our career politicians got their hands into the public till after being lawyers. So they re busy passing laws which say all kinds of feel-good things that are so vague they don't upset the people who re-elect them. Then it's up to judges to decide what the new laws mean in practice.

Take that seemingly well-meaning Americans With Disabilities Act of 1990, which set a modern record for vagueness. Barriers to the disabled must be removed "where removal is readily achievable" and the cost "not unduly burdensome." Civil rights protection is extended to all Americans with impairments that "substantially limit" one or more of "major life activities."

Well, I'm going to sue the next company that refuses to hire me. You see, I'm disabled because I'm 77 years old, and for no other reason. That's age discrimination. That "impairment" is limiting my major life activity of making a living.

So we have expensive spectacles such as the recently deceased Judge Garrity's forced bussing of kids. Surveys have proven this a huge failure, with us taxpayers picking up the multibillion dollar tab.

If legislators would enact clear and definitive laws, they might be able to save us a lot of misery and expense. It'll never happen.

Crystal Ball

Jim Guinta W3WA asked what I thought amateur radio might be like if the present trend continues. Golly, that's difficult to imagine! What do you think?

Of course, if the League got busy promoting the hobby, we might stand a chance. There certainly is a lot of pioneering still left to be done. Packet at 9,600 baud is pathetic. Let's get busy adapting digital compression technologies to amateur radio. We should be able to send most of the stuff they're doing on the Internet.

But, if things continue as they have, we'll have almost no incoming hams, ditto Techs upgrading.

The pioneering today is in the Internet. By 2010, we should be able to join chat groups on just about any subject of interest, with participants anywhere in the world. and automatic language translation. We'll have access to any movie ever made, and tens of thousands of old TV shows. Between the Internet and the 2010 version of DVDs (probably the size of a penny), we'll be able to learn about any subject we can imagine via an interactive video course.

Will anyone even care if some one or a group goes to some rare spot and sets up a satellite-linked Web site? Will I go yet again to Navassa Island (KC4AF in 1958 and KC4DX in 1973), down between Haiti and Jamaica, to put digital video pictures of the island and a travelogue on a Navassa Web site? But then there's no League to offer a certificate for people contacting 100 countries on the web, so there may not be much interest in Web DXing.

So, if the present trends continue, what's your guess for what amateur radio will be like in 2010?

Schools 2020

I probably should make my prediction for 2050, but I'm always over optimistic about how long it will take for changes to be made. At any rate. I have a vision of the future for our schools and you can do like 99.99% of the people and either scoff or ignore it. Or you can say, hey, there's one hell of an opportunity for me to help move the world along, and make some money doing it. That's always a good combo.

With virtually all of the stuff that's included in today's curriculums for K-16 eventually being available on either DVD or whatever better medium replaces DVDs, amazingly interactive ways of learning will be open to our kids. Note. I did not say anything about teaching or learning today, which seem to be virtually lost concepts in our present public school system.

Most of the classrooms by 2020 will be in laptop DVD/ Internet units, not in school buildings. Courses will be taught by performers and kids will learn because it's fun and they want to learn, not because they will be punished if they don't, as it is today. The Sudbury Valley School in Framingham (Mass.) has shown that this heretofore unthinkable concept actually works.

Many animal trainers have learned that they can do much more using love instead of punishment, but this concept still seems alien to many parents and most certainly is to the public school system.

But with DVDs easy to carry and Internet connections everywhere, kids will be free to travel and see the world, taking their classrooms along with them. The teachers' unions are going to fight this to their death, but the need for teachers will inevitably fade away as they are replaced by professional actors teaching via DVDs. This will mean a need for fewer administrators, too. Plus the need for very few classrooms and their maintenance. Fewer books, too. In all, the cost of educating kids may be able to be cut by around 75% or more, with the resulting education vastly superior to anything available today at any price.

Okay, let's take some of those savings and invest them in a different kind of education.

If our schools go to a 50week per year schedule, as I have proposed, with students having the option to take "vacations" whenever they want, we could put the savings into group tours of other countries. If kids, starting, say, at around ten years old are able to go in groups to visit other countries, laptop classrooms in hand, by the time they are 18 they'll have been able to visit over 25 countries, spending a week or so in each one. With over 200 countries out there to visit, our kids wouldn't seriously bog down the visiting facilities in other countries. But then, our program would, I believe, quickly be adopted by more and more countries for their kids.

It doesn't cost very much per passenger for dedicated flights, but to get the program started, I'd suggest making a deal with the airlines to fill any unsold seats with student travelers, each with a box lunch provided by the school travel program. This would keep the added cost to the airlines of filling the unsold seats to almost nothing, making things like a \$100 fare to Kenya feasible.

The visiting students would be met and shown around by local students, anxious to take advantage of the opportunity to improve their English. I suspect that special hotels would soon appear in one major city after another, catering to these student tour groups. This would also help to keep costs to a minimum.

Hmm, let's see. If a million American kids are in the travel program, and they're visiting 200 countries, that would net out to about 5,000 per country, divided by one week per visit for 50 weeks of the year, would give us about 100 students visiting a country at any time per one million kids in the program. That wouldn't overload even the smaller countries, and the larger cities would easily handle ten times that many visitors, and love it.

So, with most of the stuff kids need to learn, and that's vastly more than they're learning today, being taught via laptop classrooms, why would we need schools at all? That's easy. With both parents working we'll still need the baby-sitting function of schools. Plus I envision our schools helping kids to learn far more skills than at present, and most skills require equipment. But, rather than have every school have to have a chemistry lab, an electronics lab, and so on, my idea is for every school to build some sort of a lab into a tractor trailer so it can be used to service a dozen schools — being moved from one school to another every couple of weeks or so. In this way, we can have one for video production, another for audio recording, one for computer repair, one for cooking, another for woodworking, one for metalworking, another for optics, glass blowing, car servicing, and so on.

The students would know what labs would be available and when, and could sign up for those that interest them. Yes, of course there would be promotions on the Internet explaining what skills each lab would help them acquire and the benefits involved. Whoops, I almost forget one with driving simulators, another for flying, etc. Simulators

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Mobile. Portable and Emergency Operation

Steve Nowak KE8YN/4 1011 Peacock Ave. NE Palm Bay FL 32907-1371 [ke8yn@netzero.net]

Promoting Mobile and Portable Operations

This month, Steve looks at the many benefits of mobile and portable operations. He also points out how they can be used to expose nonhams to our wide world of radio, plus shows us how an HF station can pack into a briefcase for any remaining Y2K preparedness we might need.

Thy do so many of us enjoy operating mobile or portable? Like most aspects of ham radio, there are almost as many reasons as there are amateur radio operators. For some people, it is just a practical decision. People who live in homes that have deed restrictions or covenants prohibiting antennas may find that mobile operations are the only opportunity that they have to get on the air. In other cases, it may be a matter of time; the time spent in the car may be long due to an extended commute, so the best time to get in some ham radio time is while driving to and from work. With some occupations such as truck driving, the entire day might be spent driving, so the radio may be a way to enhance the hours as well as to provide a good backup communications system. Believe it or not, there are still some places where ham radio signals go and cellular signals don't! For others, it may be in support of another interest; if you have the pleasant opportunity to spend significant time sailing your boat or touring the country in a motor home, a small ham rig can add 10 dB to the overall enjoyment of the experience.

In each of these cases, there are certain benefits that appeal to each operator differently. For some, it may be the joy and appreciation of a technologically oriented gadget. There is a certain intrinsic appeal to the look of a well-designed rig with many features mounted in a prized vehicle, especially now that rigs have gotten so small. No cell phone or other gadget can compare to a nice multiband rig neatly installed in an automobile.

Some people just enjoy the chance to communicate. Operating mobile allows you to chat with the usual gang on the local repeater or with someone in a location you may have never even heard of before. And, there is the "rehumanization" aspect: After a hard day of work, the chance to get on the air may help you to mellow out considerably before getting home.

Why operate portable?

Portable operations provide a whole new

set of opportunities. If your job involves a lot of traveling, a portable rig may allow you to get in some radio time from the hotel room. With the band open now, ten meters is ideal, and a small 10 meter FM transceiver, power supply, and dipole can be easily packed into a corner of the suitcase. A gel cell and trickle charger take up even less space than a small power supply, and the rig and antenna may then fit into your briefcase.

Going camping? What a great opportunity to operate campfireside. Your wife wants to take the family to her brother's for the weekend? Here's the chance for you to sneak off and get in some DXing while everyone else is forced to listen to your brother-in-law's same old stories.

Sharing the hobby

There is another great reason for mobile and portable operations. Mobile and portable ops provide a wonderful chance to share the hobby with others. Unfortunately, ham radio is one of the best kept secrets around. It's odd that a hobby which features communicating with the whole world manages to be kept under wraps by its practitioners. Think of it - in some cases, we may be in contact with hams on the opposite side of the world more regularly than we are with the neighbors across the street. We share the hobby with those who are already involved but rarely with those who might become interested if favorably exposed to amateur radio.

A shortage of young hams

How many young hams do you know? By young, I mean truly young as in less than 30, and not relatively young as in anyone born after I was. Now deduct those who have a parent or other close relative who is a ham and who brought them into the hobby. How many can you count now? I'll bet the small number you had before now approaches or has reached zero. Now, compare that to people in the same age bracket who are computer literate. Quite a difference, isn't there? No, it's not because



Photo A. Kids of all ages are drawn to ham radio. It's up to us to encourage their interest and enthusiasm.

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today's youth is undisciplined, disrespectful, disinterested, or intellectually compromised. The reason is that almost everybody is exposed to computers, while very few are exposed to amateur radio. You can't become interested in something about which you know nothing.

Why did we get into ham radio in the first place? Because it is fun, that's why! Note that I did not say that it was fun - it is fun. Kids will still be drawn to ham radio the same way they always have been, but most of them are never exposed to it in a way that creates interest. It is almost the opposite, in fact. Each of us is rightfully proud of the fact that we passed the appropriate tests to get licensed. Unfortunately, we sometimes focus so much on the rigors that we scare people. C'mon — this is a hobby, not navy SEAL training we're talking about! Getting a ham license is a landmark, not an ordeal. We need to show others what a fun hobby it is and stop scaring them off.

There are many people out there who may have a potential interest in ham radio but don't know how to break into the hobby. There are others who could be interested if they were exposed to it. In the old days, it was not uncommon for a potential ham to notice an antenna array on someone's house and to go knock on the door to ask about it. In this way, many a youngster found a willing Elmer who would guide and coach them and get them started in the hobby. Today, our society no longer encourages such straightforward contact. A young man or lady who mentioned trying such a tactic to parents would probably be advised that such activity was not appropriate or safe for a number of very good reasons. Therefore, we as hams need to expose people to the hobby in a positive and interesting manner in a safe environment.

While it is true that there is information out there on becoming a ham, people have to really be determined to find it. There are many new giant bookstores out there with millions of books. Some of these stores include restaurants or coffee shops to make the book buying experience more pleasant. They have books on everything — well, almost everything. I haven't seen a book about ham radio at the bookstores in my neck of the woods. Ham radio books may be special-ordered, but that presumes that you know which book you want; the whole appeal of a bookstore is that you can flip through different books to see which ones you like. So how about the local library? If the aspiring ham is lucky, there may be a four- or five-year-old copy of a dry license preparation manual. In most cases, that's enough to sour him or her on ham radio and send the individual back to the Internet.

A different approach

I propose a different approach. Let's take ham radio out into the community and expose everyday people to the fun of the hobby. There are all kinds of groups who might be interested. Among the young

people there are Scouts, the Boys' and Girls' Clubs, and don't forget schools. Give a busy teacher a break, and offer to do a presentation during science class. If you work with ARES or RACES, how about a presentation at the Red Cross meeting for disaster services volunteers? And then there are the senior centers, where many folks who never had the time before now meet.

Of course, you want to present something interesting to these folks. People react to what they can see or hear or touch better than things they merely hear about or read about. This is exciting stuff, so let's show them some things that they haven't seen. Make it something different, yet keep it easy to understand. Two meters is easy to transport and show off, but in most cases it's kind of predictable. Everybody has seen cell phones, Citizens Band, and Family Radio Service radios, so unless you have a schedule lined up with the space shuttle, I wouldn't rely on two meters or 440 MHz to get people excited. Of course, the other extreme is equally unsatisfactory. This is the



Photo B. Many modern HF rigs such as the Alinco DR-M03 10meter FM transceiver readily lend themselves to portable operation and can be taken almost anywhere.

Field Day demonstration where sixteen hams set up a circus tent with a 2,000 watt high frequency station requiring tons of equipment and 3 miles of antenna wire.

Have radio, will travel

Why not use a portable rig? A modern six-meter or ten-meter rig may require only two connections - one to a power source and one to an antenna — and it's ready to operate. A dipole or other wire antenna can be strung up quickly in a minimum amount of space with very little effort. If you've operated on the band regularly in the past, you should know which repeaters are able to be accessed, so try to orient the antenna appropriately. In a matter of minutes, you could be on the air talking to a station a hundred or a thousand miles away. Pass the microphone around and let others try a little DX — we sometimes forget how addicting it can be. If you brought along a handful of

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NEW AUTOTUNER

LDG Electronics has announced the AT-11P, a new model in their autotuner line of products. The MP features a dual cross needle meter, providing forward/reflected power and SWR indications. Additionally, an optional remote head is available to allow the tuner to be remotely mounted and still have control over the functions and visual indications of its status.

The MP also features an interface for the Icom IC-706 radio. While it will operate with any HF radio, the AT-11MP will use the built-in tune button on the IC-706 faceplate and tune when this is pressed.

The AT-11MP operates 1.8 to 30 MHz at 5 to 150 watts continuous. The tuning circuit

features a switched "L network" and is microprocessorcontrolled via a Motorola 68HC11. Power requirements are 11 to 14 VDC with a current consumption of 15 to 500 mA (250 mA average). The AT-11MP will tune practically any coax feed antenna.

This unit is available fully assembled and tested for \$239; as kit with enclosure, \$199; and as kit without enclosure, \$169. For the optional remote head, the prices are \$39 assembled, \$29 kit. A balun impedance matching transformer is available to allow the tuner to tune endfed, longwire, and random length antennas: \$30 assembled, \$25 kit.

For further information, contact LDG Electronics, 1445 Parran Road, St. Leonard MD 20685; tel. (410) 586-2177; fax (410) 586-8475; E-mail [ldg@ldgelectronics.com]. Their Web site can be found at [www.ldgelectronics.com].

NEW HAMTRONICS CATALOG ... PLUS

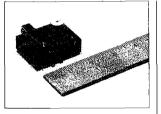
Hamtronics has recently released their new Year 2000 catalog, which contains 40 pages of kits and wired units for amateur radio, two-way shops, scientific and industrial users, and OEMs. Several new products have been added to the usual lineup of high quality VHF and UHF.

The T304 and R304 are new UHF versions of their popular exciter and receiver modules using new low-noise frequency synthesizer technology. The LNY is a new series of low-cost VHF and UHF receiver preamps. The LNP is a new line of VHF receiver preselectors with a low-noise preamp built in, helping to eliminate intermod interference from paging transmitters and other out-of-band sources.

These new products are added to the already popular selection of VHF and UHF FM transmitters, receivers, power amplifiers, transmit and receive converters, preamps, repeaters, DTMF controllers, autopatches, and digital radio modems that Hamtronics has manufactured for 38 years.

For a free copy or further information about any Hamtronics product, contact them at 65-D Moul Rd., Hilton NY 14468-9535; tel. (716) 392-9430; E-mail [jv@hamtronics.com]. Their Web site is at [www.hamtronics.com]. Remember to say you saw it in 73!

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NEW FROM PADDLETTE: MINIATURE PADDLE KEYKEYER COMBINATION

Paddlette Co. is pleased to announce two new products, their models KP-1 and KP-3 iambic paddle key/electronic keyer combinations. Both models combine a Paddlette key with an Embedded Research TiCK keyer IC in a tiny 1-1/2" x 2" enclosure — total weight: 1.7 ounces.

Both units generate strings of dits and dahs in response to paddle strokes, and in addition provide a menu of keying options to the user. These are accessed by holding the push-button down until the desired Morse character is heard. then releasing the button and following the simple instructions in the manual. The basic KP-1 menu items and Morse symbols are: speed — "S"; tune - "T"; paddle select -"P"; piezo on-off — "A"; straight key mode — "SK"; and iambic mode A/B — "M". The model KP-3 adds two 50-character message memories and recalls plus a beacon mode that will repeat either message ad infinitum (or until user hits either paddle).

Both are very high quality, professional-grade units rugged, reliable, and easy to use. They are completely selfcontained, including the 200 mAh, 3 volt lithium coin cell. Key-up current drain is 1 microamp: key-down drain is 0.6 milliamp. Battery life under average operating conditions (two hours per day, 365 days a year — 50% sending. 50% receiving) should exceed one year. Output is to a 1/8-inch mono jack and will drive any normal solid state transceiver. Both models feature a very strong magnetic hold-down and an optional knee mount.

Prices: Model KP-1, \$72; with knee mount, \$79.75. Model KP-3 \$82; with knee mount, \$89.75. Shipping and handling: \$3.75, first class U.S. mail.

To order or further information, contact Bob Hammond KI7VY, Paddlette Co., P.O. Box 6036; Edmonds WA 98026; tel. (425) 743-1429; E-mail [bham379627@aol. com].

LOGWINDOWS 3.06.50

Creative Services Software has now released its latest update to Log-Windows, version 3.06.50. Created in 1994 by Ira Chavis WA1W, LogWindows interfaces with all of the CSS TNC host mode programs, including PacTerm '98, PKTerm '99, and MultiComm Host.

LW 3.06.50 is now on the Web at [www.cssincorp.com/logwindows]. This version is a combination activation key, and use the full capabilities of the program. Installing the demo version will overwrite any older version already installed.

Prices are \$49.95 retail (16-bit); \$25 current upgrade; and \$35 competitive upgrade for users of other log programs. New purchasers of or upgraders to 3.06.50 will receive all future 3.x upgrades for free, as well as a free upgrade to the 32-bit version when it becomes available.

For further information, contact Creative Services Software, 503 West State Street, Ste. 4, Muscle Shoals AL 35661; tel. (256) 381-6121; E-mail [sales@cssincorp.com].

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Low Power Operation

Michael Bryce WB8VGE SunLight Energy Systems 955 Manchester Ave. SW North Lawrence OH 44666 [prosolar@sssnet.com]

Tending the (Antenna) Farm

This month, WB8VGE takes us a couple of steps further in QRP fun with some good pointers on building and using QRP gear. Truly, QRP is the route to low cost and go anywhere hamming!

It's almost springtime, and what better time of the year to fix up the antenna system after all those winter storms. And, according to the people who are supposed to know these things, the solar index is getting higher and higher. It's really going to be easy to work the world with a watt or two during the coming spring and summer season.

But before the snow starts melting, it's time to check out the antenna farm. Since we moved from the old homestead, our new QTH is lacking a single tree for holding up antennas. I managed to tie off a nylon rope in a neighborhood tree. The other end is attached to the eve of my house. The distance is about 700 feet.

Between the two, I have an all-band folded dipole that covers 80 to 10 meters,

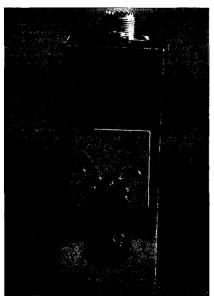


Photo A. Here is an old CB-type SWR meter. It's easy to use and works great in the HE bands.

including the WARC bands. The dipole has an SWR of less than 1:2 on all bands. On some bands, such as 30 meters, the SWR is flat across the band. Since I had installed this antenna in the late fall, it had to go up and stay operational all winter long.

Since all I operate is QRP, I had to get the most out of this antenna. So, if you're going to work on your antennas before winter, you may find these tips helpful in increasing the efficiency of your antenna system.

Since I had such a long run between the transceiver and the antenna, I used a very good quality of coax. The coax is made by Belden and is RG-213U. Since the majority of the cable is run on top of the lawn, I choose the type that has an UV proof jacket.

Coax does not last forever. If your coax says "Allied" or "Olson," it's time to replace it! Coax does wear out due to UV breakdown. Water can easily get into the jacket and the braid, making the entire length of coax nothing more than expensive garden hose.

The dipole is really heavy. I used 3/16" dycron rope. Had I known how heavy the dipole is, I would have used 1/4" rope instead. As it is now, the rope is straining as tight as I can pull it. Even at this tension, the dipole sags in the middle. To keep the weight off of the rope as much as I can, the coax between the balun on the dipole and the ground is Belden mini 8.

A "barrel" connector was used to tie the two together. To keep water from entering the coax at the connection, wrap the two connectors and the barrel with two layers of electrical tape. Keep the tape as tight as you can while you wrap the connection. Be sure to extend the tape well past the connectors. After the layer of tape, put on a layer of coax seal. This stuff will keep the water out of the coax. The tape is there so that you can remove the coax seal and still unscrew the connections. Without the tape, it's almost impossible to remove the coax seal!

Oh, yes, lest I forget: Don't try to save a buck by using cheap SO-239 connectors. It's false economy! I use only silver-plated connectors. I really don't see the need for gold-plated connectors for my use. And, please, don't use "used" coax connectors. It's not worth the hassle to get all the solder out of a connector, so use a new one!

If you have more than one radio, then use a good quality coax switch. I still use my old Heathkit switches that I assembled



Photo B. The Ten-Tec Argonaut 509 has a built-in SWR meter. As a matter of fact, all the Argonaut series have SWR meters. Don't use an external SWR meter if your rig already has one inside. It's a waste of watts.

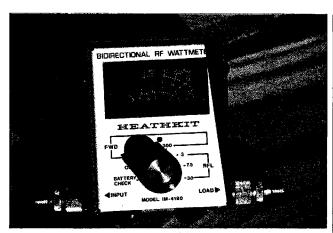


Photo C. Here's a Heathkit IM-4190. It's great for QRP, but does require a 9 volt battery to be installed inside.



Photo D. Ten-Tec makes this small tuner that's perfect for mobile use or QRPing in the field.

decades ago. They still work like new. I know of one ham that uses a patchboard with all connections via BNC connectors. This eliminates all the loss via the coax switches, but it's not what you need if you plan on contesting.

New antenna at my house

Right after I put up the all-band folded dipole, I started to assemble a Gap antenna. I won't get into the "how it works," but I can say that it does what it is supposed to do.

That thing is big. It's somewhere close to over 25 feet high. It's not an easy antenna for one person to get up in the air. Gap has a foldable mount that allows one to walk the antenna up into a vertical position. I am too cheap to spend that much money, so I came up with a tilt mount all my own.

This version is very easy to make. In fact, it's a no brainer! All you need is a six-foot piece of 4 x 4 treated lumber, a 30" piece of 1/14" schedule 40 water pipe, and some 3/8" by 7" bolts, nuts, and washers.

The first step is to dig a hole 18" in diameter and about 3 to 4 feet deep. Before the 4 x 4 is placed into the hole with some cement, you need to drill two holes into the 4 x 4. You will need a large drill press to handle the 4 x 4 and the pipe. Secure the pipe to the 4 x 4 with some wood blocks and clamps.

You want to locate the 30" pipe up onto the top two feet of the 4×4 . Here, you'll drill two holes. One is placed near the bottom two inches of the pipe; the other is located up 20" from the bottom hole. We're not launching missiles here. Just eyeball the measurements. The idea is to have one hole at the bottom of the pipe, and the other hole up about 20" or so.

If you take a smooth bastard file and file down the pipe so that it is flat, you'll provide a better spot for the drill bit to bite into. Before you start the drill spinning, be sure you have the pipe well clamped to the 4×4 . The idea is to drill through the pipe and then into the 4×4 . When the first hole is done, drill the second hole. If you do this correctly, then you'll have two holes in the pipe and two holes;

in the 4 x 4. And if things did not slip, all the holes will line up correctly.

With the holes drilled in the pipe and 4 x 4, it's time to cement the 4 x 4 into the hole. I use the stuff in a bag, but don't mix it with water. Instead, I just pour the cement into the hole dry. The moisture from the ground is all the water you need. I know it sounds goofy, but it really does work.

With the mount secured into the ground, the small pipe is attached by the two bolts. The longer pipe is then screwed into the smaller one with a pipe coupler. With the two pipes now one piece, the Gap antenna is mounted with the mounting hardware supplied

with the antenna. When the Gap is secured, the entire apparatus is walked up into a vertical position. The antenna is held upright with the last bolt.

This mount works just great on the Gap antenna. It will work with just about any vertical antenna. Since the Gap antenna does

Continued on page 61



CIRCLE 13 ON READER SERVICE CARD

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From Feld-Hell to MT63 to More PSK

Ham radio is fun. Even more so is the exhilaration experienced when your computer speaks through your radio to another similar setup thousands of miles away, and that is what this column is about. It gets easier and more dependable all the time, as you'll learn when you read on.

Awhile back, I mentioned Hellschreiher. a very old digital concept that has been resurrected and is being used by hams partly because it is different and mostly due to the fun and feeling of accomplishment that comes from not following the crowd. It is an interesting mode, and it deserves a look by you and me.

The quick bird's-eye view I gave earlier was that it resembled a system of facsimile. It does, but the part that piques my interest is that it was invented in the 1920s and used by the German army, apparently successfully.

There is an alternate name for Hellschreiber: Feld-Hell. With a name like mine, you would think all this would make sense. I still had to look it up. The first name I mention translates to "bright writer." Feld, meaning square, changes the meaning to "bright square." I am not sure what is so bright and shiny about this mode but, in looking at a picture of the output, the large square "pixels" forming the letters seem to make for a fitting name.

Some exciting news that Pete KE4PPI sent in an E-mail is that there is at least one other digital mode out there to add to our list of toys. If you go to the URL in **Table 1**, you can learn all about the MT63 mode. It is a more modem development, and those who have used it claim excellent results under poor conditions, much as with PSK31.

There is one drawback. The width of the signal is minimally 500 Hz, and it can be run at 2,000 Hz. Nevertheless, it is interesting to read about the evolution of it, as some of the same people who worked with this had a hand in the development of PSK31. Just a little aside here: "History" in digital territory has been written mostly during the last 20 years, and my opinion is that the advent of PSK31 by the ham community is soon to have a positive influence on

commercial/military communications. It will either be borrowed or adapted and put to good use to replace some of the older, slower modes.

Use your soundcard

You will be interested to note that both of the modes mentioned above can be operated with the use of your soundcard, just as you would for PSK31. Some devoted hams have gone the extra mile and written the necessary software. Also, there are instructions to get you past the setup hurdles, and you will find all the information you ever want on the Web site concerning frequencies and times used by the devotees.

The rest of the PSK hookup

I have put off building a keying circuit for some time because you can, for the most part, switch between transmit and receive manually on PSK31. I am not alone here. I have communicated with others while still manually switching between transmit and receive. It is just so easy to get this running, and difficult to stop having fun and return to the finishing touches.

A lot of hams have downloaded the free PSK31 software. All that I have tried works well. A few hams have expressed the opinion that one version works and another doesn't. Possibly there are conflicts with certain hardware. The biggest stumbling block is the hookup. That shouldn't be difficult, because there are lots of instructions out there.

My way

My preference is to use the accessory jack on the back of the Icom 735. It works well, with no need for a special attenuation circuit as is necessary when using the mike jack. My first hookup was two shielded audio cables from a 5-pin DIN (yes, into the 8-pin DIN) to the Line-in and Line-out jacks on the SB-16 soundcard. That was instant success, but I had to toggle the transmit button on the radio plus click the appropriate button on the screen to switch between transmit and receive. But it worked, and I had other busy projects.

I might add that there is a problem with this straightforward hookup. You do have to set the volume on the soundcard software control to avoid overdriving the radio. And you will need to reset it from time to time. The instructions with the software explain the procedure. It will work for you. The problem is that this is not quite as convenient as setting a pot on an external attenuator, which is what you use if you connect to the mike jack of your radio.

Whatever hookup you use, you will want to include a circuit to key the PTT from the PSK software. Finally, I bit the bullet, studied various recommended circuits, and put together the one in Fig. 1. The cost was minimal. You can purchase anything you need to do this at Radio Shack. The computer connection is the serial port.

This was chosen because it was the most direct approach and, with a little effort, I was able to lit it into a 9-pin connector. In the end, I have the PSK31 interface having three cables terminating in a 5-pin DIN plug that fits into the accessory socket (#1) on the back of the Icom 735. The two stereo plugs fit into the soundcard jacks, and the new third leg simply plugs into the serial port of the computer. I considered taking a photo of the finished product, but it wouldn't show much. The fine details of fitting everything together get lost unless the picture

is blown up to a half page. Refer to the description with the schematic.

It took a little fiddling with the PSK program to determine which laptop Comm port Windows95 was directing the PTT signal to from the software. There is only one visible port, but there is the mouse and the modem to contend with and Windows95 makes its own choices there. Comm 2 works in this case. Yours may be different. After that, life is good. The PSK31 software now tells the computer when to transmit and when to receive.

So, the next assignment was to adapt (simply plug in?) the cable to the 25-pin desktop. After securing the correct-gender 25- to 9-pin adapter, getting the cables into the soundcard of the computer, and setting the configuration to PTT in the Logger software, it didn't work.

When all else fails

Well, there were some choices. There is a great manual all printed for this program. But first. ... To prove who's in control, I have to give everything a once-over and use up the time the manual would have saved. In this case, I did stumble on the answer before looking in the printed material.

There is a configuration window that gives a PTT port choice with three options. I had chosen the dedicated option. That apparently conflicted with some other choices I had made previously. The problem cleared up when I clicked on the "shared with radio" option. Then ... I went to the manual that I have with numbered pages but no index. On page 107 the procedure is described.

It was there all the time, and I am not smarter than those who wrote the book (though there are bits of advice that conflict somewhat with what I had done). I think the conflicts refer back to what I said about looking at all the various circuits before I started this project. Everyone has a different opinion. I hesitate sometimes to state mine because there is the distinct possibility that my best shot is just waiting to be shot down, but you will find what works for me in the attached information.

Pegasus

There is a relatively new radio on the market from Ten-Tec. The Pegasus is a low-cost radio with a smart computer software front end that seems to be tickling the tastes of digital users I talk to on the air. While I was experimenting with the PTT on my old-fashioned Icom 735, I ran across two Pegasus users in a row who just couldn't say enough good about their new rigs. And they

Source for:	Web address (URL):
Pasokon SSTV programs & hardware	www.uitranet.com/~sstv/lite.html
PSK31 — Free — orig. PSK31 — also Logger	http://aintel.bi.ehu.es/psk31.html
Site with links to PSK31 and Logger 6.12	www.mysite.com/k5fq
PSKGNR — Front end for PSK31	www.al-williams.com/wd5gnr/pskgnr.htm
TAPR — Lots of info	www.tapr.org
TNC to radio wiring help	http://freeweb.pdq.net/medcalf/ztx/
ChromaPIX and ChromaSound DSP software	www.siliconpixels.com
Timewave DSP & AEA products	www.timewave.com
Auto tuner and other kits	www.ldgelectronics.com -
XPWare — TNC software with sample DL	www.goodnet.com/~gjohnson/
RCKRtty Windows program with free DL	http://home.t-online.de/home/d14rck/
HF serial modem plans & RTTY & Pactor	http://home.att.net/~k7szl/
SV2AGW free Win95 programs	www.forthnet.gr/sv2agw/
Source for BayPac BP-2M & APRS	www.tigertronics.com/
BayCom — German site	www.baycom.de/
BayCom 1.5 and Manual.zip in English	www.cs.wvu.edu/~acm/gopher/Software/baycom/
N1RCT site — excellent RTTY ref.	http://www.megalink.net/~n1rct/
Int'l Visual Communication Assn. — nonprofit org. dedicated to SSTV	www.mindspring.com/~sstv/
Creative Services Software	www.cssincorp.com
Hellschreiber or Feld-Hell	www.qsl.net/zl1bpu/
MT63	www.qsl.net/zl1bpu/MT63/MT63.html

Table 1. List of on-line sources.

weren't fresh out of the box, because they both told me about the several software updates they had already installed. My only experience so far concerning

Continued on page 61

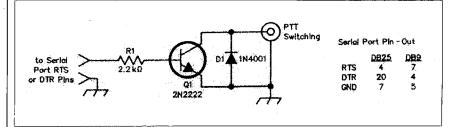


Fig. 1. Two choices exist for keying the circuit from the serial port, either the RTS or DTR pin. I chose the DTR. Pinouts for 25- and 9-pin jacks are provided. There are only three small parts, and they fit handily inside the 9-pin Radio Shack connector hood. The shielded cable to the radio port is, in the case of the IC-735, connected to the 5-pin DIN for the Accessory I socket. That socket has 8 pins, but only four are used, and the 5-pin plug fits those that are needed. The finished product is the DIN plug with three shielded cables — one to the serial port, and two to the soundcard. See text.

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B'reshith — Beginnings

Way back 35 years ago, I never would have believed that I would be writing the DX column for 73 Magazine. No way, Jose! But Evelyn Garrison can be a rather persuasive individual, as some of you already know. Then again, I said something similar nearly two years ago when I started doing features and a monthly show for HCJB World Radio. The fact is that I have since developed a passion for journalism. Not bad for the guy who flunked freshman English at Arizona State University, eh?

Well, 35+ years of hamming and four college degrees later, here I am. There were two things that finally flung me over the fence — three, actually. First of all, it has been way too long since there was a DX column in 73 Magazine. The second is that if you read Dave Ingram's "wish list" in last month's issue, you may have noticed that DXing didn't make the list. I just had to do something about that. Finally, I came to the realization that over the years, the one thing that has kept me interested and active as a radio amateur is my love of DX. Now I not only get to chase it, but I can write about it, too. Way cool!!!

Before I overwhelm you with my enthusiasm, there's something else you should know. In the process of giving his approval for this column, and for my authorship as well, Wayne Green challenged me with the statement, "We don't need just another DX column." I have to give it to the old cuss, he's right on the mark. There are numerous excellent columns in print today, and you

are all aware of most of them. In addition, the Internet provides almost real-time information on what is going on around the globe. So why add 73 to the mix? What in the world can this magazine do to add value to what is already being read by hundreds of thousands of DXers worldwide? My proposal is to focus on people who chase DX — their likes, dislikes, adventures, and opinions. In addition, I intend to join with organizations like the Ontario DX Association to provide a focus and a forum for the often-overlooked individuals who also love to chase DX, namely shortwave listeners. I recall that for six years prior to getting my ham license, I was a shortwave listener. And guess what? I still am!

To be sure, this column will also provide newsworthy items, QSL information, contest info, and reports on DX peditions. There will be interviews with both the plain and fancy among us, as well as some nostalgia. It will be fun to explore some trivia, and to see what has happened to some of us old-timers over the years. Speaking of which, check out this QSL card (**Photo A**) I found in an old shoebox. I had a QSO with this guy way back in the early '60's. I recall that working this guy was one of the events that played a role in getting a young high school kid who looked an awful lot like me interested in DX. Does anybody know what ever happened to him? Does he even get on the air anymore? I hear that Art Bell might know his whereabouts.

Oh, and how about this QSL (**Photo B**)? I had the great pleasure of operating for a few months in 1994 and 1995 from BY1QH in Beijing, China. These young gentlemen were my hosts. I also had the great honor of attending one of their graduation parties, and treated them all to dinner on the Tsinghua University campus. A little over four years has passed, and I am sure that most of them have completed, or are about to complete their graduate degrees. Anybody out there know what they are doing now? If you have any info, please drop me



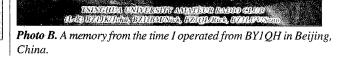




Photo C. Before and after.

a line, and I'll do a short "before-and-after" feature on them. Don't forget photos.

Speaking of before and after, some of you are probably wondering what I look like (and even more couldn't care less, I'm sure). So here is a glimpse of the DX hound himself (**Photo C**). The guy on the left is me at the ripe old age of 16. Back then I was the president of Saguaro High School's amateur radio club in Scottsdale AZ.

My call back then was WA7CNP. To the right stands the same guy with bigger pants, and less hair. Now my call is N6NR, and that gorgeous gal next to me is XYL Connie W7CDO. Nobody has yet come up with a rational explanation as to why such a goodlooking lady settled for a guy like me. She says it was because she likes my singing. Man! I hope I don't lose my voice.

The DX Dynasty Award

I'm not too excited about engaging in auto-revelation, but they say that confession is good for the soul, so here goes. Back about 1975, my DX passions were heating up to afterburner proportions. I was becoming a real card-carrying QSL hound, so much so that the horns on the top of my head were becoming quite visible. My onthe-air behavior was in rapid decline, inversely proportional to my snagging the next rung on the DXCC ladder. I was determined to make the Honor Roll before I hit 30. It was about that time that a dear friend several years my senior (and whose callsign is awfully close to mine) took me aside and explained to me that I was embarrassing myself, as well as my fellow members in the Central Arizona DX Association. By the grace of God, I saw the wisdom in what he was saying, and made the decision that there were other priorities which transcended the ravenous acquisition of QSLs and endorsements on my DXCC certificate. Before

long, people would actually say HI to me once in a while at DX club meetings, and getting on the air was becoming fun again.

To this day I don't chase after OSLs, and my DXCC certificate still only has a 160-country endorsement, despite the fact that my logbook has over 320 worked in it. DXing is still a blast, and the guys at the Western Washington DX Club don't run the other way when I show up. The way I figure it, OH2BH and I both have a few years left in us, so I can still look forward to working some new ones.

Now, if that sounds a bit like you, don't worry ---I'm not going to ask you to come to my confessional. Rather, I'd like to offer an alternative to the great expense of OSL hoarding, and immense frustration when one of the big guns works one over the top of you. It's called the DX Dynasty Award,

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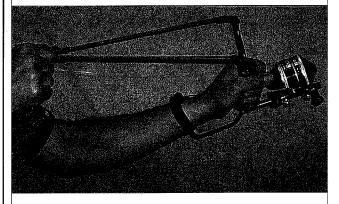




CIRCLE 141 ON READER SERVICE CARD

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Photo D. This photo shows the four DX peditionaries at their respective listening posts.

and it's available to those like us who have a high degree of integrity, and are satisfied with just "havin' 'em in the log." Here are the rules:

The basic award is issued for 100 countries worked. If you pull funny stuff with your log, YOU are the one who has to look yourself in the mirror EVERY DAY knowing that you were not entirely honest with us. Endorsements come in 50 country increments up to 350, and then by 25 after that (i.e., 250, 300, 350, 375 ...). The basic award is mixed-mode, and there are special endorsements for you name it: CW (my favorite), SSB, baudot, ASCII, Amtor. Pactor, QRP, spread spectrum, EME, FM, AM, FAX, SSTV, and yes, indeed, SWLing. Logs submitted must clearly show the band and modes used for the specific endorsement desired. I almost forgot: There are single band endorsements for all amateur bands, if you are that resourceful.

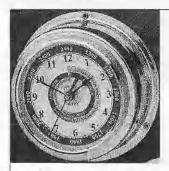
There are some specific limitations (hey, don't blame me, I didn't create this thing). Only contacts made on or after Jan 1, 1987, are eligible. All bands and modes are acceptable, including crossmode contacts (with the exception of mode-specific or single band endorsements). Signal reports are noncritical: If you can hear 'em, and they can hear you, that's a contact in our book! The countries list is an amalgam of those listed in the countries lists of award programs from any IARU nation (and I need to ask Wayne a couple more questions on how this one works, so stay tuned for further details). The addition of a country does not require that you wade through a mass of bureaucracy. Simply send a copy of the award rules from an IARU member country to 73, Attn: DX Forum, for evaluation. New countries will be announced when necessary right here in the DX Forum. If you want a copy of the DXD countries list, or an application for the award, just send an SASE to 70 Hancock Rd., Peterborough NH 03458, USA, Attn: DXDA.

The award is not free, but it is orders of magnitude cheaper when you consider all that money you saved on QSLs. The basic fee is \$6 US, and IRC are not accepted. Each endorsement is \$2 US, with the exception that endorsements given upon initial application (that's when you get the first basic award) are free. You also get your name and callsign published in 73 at no extra charge. Got it? So get it!!

Just listening

Now it's time to focus on SWL DXing. As I mentioned, I have been an SWL DXer since around 1958. My first DX was a station in Quito, Ecuador, with the callsign HCJB. I was hooked. I rapidly branched out into medium wave DXing, commonly known as the AM broadcast band. I remember listening to KOMA late at night. What a treat it was to turn out the lights in my bedroom and listen to far away Oklahoma City from my little listening post in Scottsdale AZ.

As DXing goes, that's flyweight stuff compared to what I recently discovered on the DX Listeners Club Web site from Norway [www.dxlc.com]. Their club was founded in 1955, and their mailing address is a relatively short distance from the town where my family came from, Arendal. Quite often their members will go on DXpeditions, but not in the same sense as radio amateurs are accustomed to. In this



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Photo E. Here are Bjarne (left) and Rolf at one of the antenna supports for the Pacific wire. The house is below, middle, while Kongsfjord is in the background. For all you guys who don't go below 40m, that's what the end of a beverage looks like.

case, SWL DXers, especially MW DXers, will trek to a place that has ideal listening properties, set up long beverages, and start listening and logging stations that are remarkably long distances away.

The current DXLC Web page has a report from a group of gents who went up to the northern crest of Norway in October of last year, far above the Arctic Circle, to tune broadcast stations from literally all over the world. The location of this expedition was Kongsfjord (Kings Bay). They did not, however, go there with modest equipment. Here is a partial list of what they brought:

Receivers: JRC NRD-525G. Wellbrook 1:4 splitter/preamp, Sony MZ-R50 Minidisc recorder; JRC NRD-535D, RF Systems 1:4 splitter, Sony MZ-R30 Minidisc recorder; Watkins-Johnson HF-1000, AOR AR7030+, Wellbrook 1:4 splitter/preamp, two Sony MZ-R50 Minidisc recorders; AOR AR7030+, Kneisner+Doering KWZ 30, Wellbrook 1:4 splitter/preamp. Wikander 1:2 splitter/preamp, Sony MZ-R50 and JE-510 Minidisc recorders.

Antennas: 120 meter beverage at 310 degrees, bearing to the US/Canadian East Coast, bidirectional; 400 meter beverage at 340 degrees, bearing to the US/Canadian West Coast, bidirectional; 450 meter beverage at 005 degrees, bearing to Hawaii, unidirectional; 580 meter beverage at 035 degrees, bearing to western Pacific Ocean (targets New Zealand, Tonga, Fiji, etc.) on the main lobe, Africa and southern South America on the back lobe, bidirectional, but later terminated; 500 meter beverage at 085 degrees, bearing to Japan, Philippines, Australia on the main lobe. United Kingdom, Spain, and Latin America on the back lobe, bidirectional, but later terminated. All antennas were grounded separately and fed with RG-58 coax cables via home-brew 450:50 ohm transformers.

The Team: This photo (Photo D) shows the four DX peditionaries at their respective listening posts. In clockwise order, we first have Rolf Torvik, who is one of Norske Statoil's research and development scientists. He is a veteran of these types of DXpeditions, having started DXing in 1975. Next we have Arnstein Bue, also a veteran, who has logged such stations as KHEY El Paso TX, and WRBD in Fort Lauderdale FL from his home in Trondheim. Then we have the somewhat pensive Bjarne Mjelde, who is perhaps the most senior member of the team. Bjarne is no stranger to these climes, as he lives north of the 70th parallel in Berlevag. Finally, we see Odd-Jorgen Sagdahl, who is seen after snagging a station in Hawaii. Not bad. Odd-Jorgen, but I wonder how many yanks realize how hard it is to hear the Pacific on 20m, let alone the MW bands? By the way, what is that thing they are fighting over? Is that what they use to terminate the beverages?

In their own words

As for the experience itself, what better reports than those from the participants themselves? Here is an excerpt from their diary:

Thursday, October 21st. Sunrise at 0545 and sunset at 1350. The Sun was up 8h5m, with a maximum elevation above the horizon of 8.7 degrees. Pre-expedition logs from Bjarne around 0600 on Thursday revealed some interesting signals from North America, including WRDZ Radio Disney 1300 (Chicago) w/local announcements. KADZ-1620 plus 2-3 other X-band stations. Arrived at the farm at 1500. All antennas were already erected, so the participants could start DXing right away. Conditions weren't too bad with DZAR Angel Radyo 1026 and DYWB Super Radyo 1269 already in the box. KBRW-680 very strong. Arnstein had talked to Roland Sandberg at Lemmenjoki, Finland, earlier on; he reported NA's from sunrise and many hours on. However, the Sun weather was not at all good, with predictions of unsettled to active levels. We knew little of what was to come!!! Weather: 5-7°C, windy, occasional rain. Solar weather: Daily A-index 15, low at 6, high at 32.

Friday, October 22nd, Sunrise at 0550 and sunset at 1345. The Sun was up 7h55m, with a maximum elevation of 8.3 degrees. We soon found out that the 400m NA wire didn't perform optimally. We removed the 120m NA wire and connected the former to the other coax lead-in. Much better signal. The "Pacific" wire at 035 degrees seemed to perform better than the "Asia" wire at 085 with regard to Far Eastern signals such as Japan. Less interference from Asian stations located farther west. Not much DX during the night, but in the morning we had some midwest Canada, Alaska, and western US stations. KKBJ Bemidji MN 1360 was probably the best log. Even a Hawaiian was logged, KAOI-1110, with a fair signal. At 0900 UTC we had an extremely early Japan opening when JOWF STV Sapporo came in with a potent QSA 5 signal. The hours ahead gave us a lot of stations from Japan, with an average of 10 reports each. Indeed, this looked promising! Then we received news from Boulder, Colorado regarding the solar weather... Weather: Around 4°C, gale force wind and rain.

Solar weather: Daily A-index 87, low at 19, high at 235!!! Planetary K-indices as high as 8! Severe storm conditions ...

Saturday, October 23rd. Sunrise at 0555 and sunset at 1340. The Sun was up 7h45m, with a max. elevation of 8.0 degrees. How is it possible to hear anything at all with Aindices close to 240??? Actually, we do, but not much. After a DXless night and not much more than KBRW to be heard in the morning, and a short Japan opening at around 1300 in the afternoon brought typical aurora conditions with tremendous signals from Thailand, India, and Pakistan. One example was Radio Kashmir 792 with Urdu stock market talk and a Castrol Motor Oil advert thrown in! It is a pity that local programming is so scarce. A few NWT stations were audible around 2130. The combined full Moon and aurora borealis transformed the evening dark into a greenish glow. A most spectacular view, but one we could do without. Weather: Cooling off with 2-3°C but only light wind. Solar weather: Daily A-index 26, low at 11, high at 50.

Sunday, October 24th. Sunrise at 0559 and sunset at 1335. The Sun was up 7h36m, with a max. elevation of 7.6 degrees. Around 0100 good signals from Canada's midwest followed by half-hour-long wipeouts when the band is completely empty. During the peaks, one can enjoy some of the stronger Canadians such as CFRN-1260, CFCW-790 with 8 kHz bandwidth and AM-sync. — a bit of a contrast to having to fight co-channel splatter during "normal" conditions. From 0600, a few continental US stations as well. Odd-Jorgen joins the relatively exclusive league of Norwegians having heard Hawaii on MW as he logs KAOI Kihei 1110. At around 0900 we headed for Berlevag for a most deserved shower and to purchase a king crab for our Sunday dinner. It seemed only appropriate to have king crab for dinner in our DX-ped at King's Bay. The meal was accompanied by Hungarian Tokayer white wine and Sapporo Draft beer, one that we heard several adverts for on JOWF Sapporo 1440. Truly an international meal, since the king crab itself was originally "imported" to this area from the Kamchatka Peninsula in the Russian Far East. Another tremendous afternoon for the Indian stations; even lowpower frequencies like 1602 had S-9 signals from All-India Radio. Weather: 1°C, mostly dry but some sleet towards the evening. Calm. Solar weather: Daily A-index 23, low at 11, high at 41.

Monday, October 25th. Sunrise at 0604 and sunset at 1330. The Sun was up 7h26m, with a max. elevation of 7.3 degrees. Departure day for Odd-Jorgen. Unfortunately, the conditions stay more or less the same. Bjarne drives Odd-Jorgen to the airport at

Africa	Freq 1377	Date 22.1	Time 2200	Station Comments VOFA, Tanzania, with VOA News, at 2210 a "Radio Tanzania, Dar-es-Salaam" ID fol- lowed by a looong speech by Mrs. Madeleine Albright.
Asia	729	25.1	2151	Jiangxi PBS with very clear IDs.
	792	22.1	1521	Azad Kashmir Radio, Muzaffarabad AD "Castrol Motoroil"
		25.1	1425	DZEM Manila
	1008	22.1	1327	JONR ABC Asahi Hoso, Osaka
		25.1	1256	CBS Taipai w/EE ID "CBS Taipei"
		22.1	1511	AIR Srinagar – "Radio Kashmir", 4
	1260	22.1	1000	JOIR TBC Tohoku Hoso, Sendai
	1557	25.1	1522	R. Pakistan/R. Kashmir, Skardu, very strong with Urdu stockmarket reports, spot for Castrol Motor Oil, a spot heard so often it makes us wonder if Castrol is Radio
				Pakistan's main beneficiary
noncept production of the control of	1602	22.1	1320	JOFD NHK-2 Fukushima very clear with local ID.
		25.1	1529	All India Radio, location unknown, very strong these ikW stations this evening.
Pacific	1110	22.1	806	KAOI Kihei HI- only Hawaiian during
North America	540	24.1	604	CBK Watrous SK with local weather fore cast and "You are listening to CBC Radio in Saskatchewan"
· ·	. 550	22.1	545	KFYR Bismarck ND
	850	24.1	515	KOA Denver CO
		22.1	1428	KICY Nome AK
	1090	24.1	530	KRPM Seattle WA " Classic Country 10- 90 KRPM"
	1400	26.1	551	KART Jerome ID
	1470	26.1	530	KBSN Moses Lake WA QRM CC CJVB
	1490	26.1	604	KOWL South Lake Tahoe CA
		26.1	524	KYCY San Francisco CA usually ID-ing "Yaddi yaddi Radio 15-50", only once did we notice a KYCY ID. KCCF and KVAN never surfaced long enough to be ID'ed.
	1560	22.1	813	KKAA Aberdeen SD, 3
	1580	22.1	632	KGAL Lebanon OR "Talk of the Valley", 2-3
	1600	22.1	638	KWOM Watertown MN, 2
	1630	22.1	544	KCJJ Iowa City IA for once a US rock music station on AM, "AM Stereo 1630 KCJJ".
1				1

Table 1. Log and some highlights.

1000 but misses little. Early afternoon brought a number of Philippines, DYDW Tacloban 1413, and DWCD Dagupan 1161.

Weather: 2-3°C, increasing wind to gale, rain, rain, rain, and some rain. At least the clouds hid the aurora borealis. Solar



Photo F. For those who envisioned small tents and Coleman stoves, here are Arnstein, Bjarne, and Rolf getting ready for dinner. (We Norwegians know how to go in style!)

weather: Daily A-index 18, low at 4, high at 31.

Tuesday, October 26th. Sunrise at 0609 and sunset at 1325. The Sun was up 7h14m, with a max. elevation of 6.9 degrees. During the short week of the KONG4 DX-ped, the day shortened by more than 50 minutes! Typical catches during this period were CKSW-570, CHAK-860, CFYK-1340, and many Alberta and Saskatchewan stations, especially those located north in the provinces such as Lloydminster, Saskatoon, Edmonton, Wetaskiwin, St. Paul, Westlock, etc.

This was departure day, and ironically enough this last day produced quite a number of Northwest US stations, mainly in Washington but some from Oregon, too. Three WA/CA stations on 1550 were heard with around equal strength, but only "Yaddi yaddi Radio," KYCY, bothered to ID. Also equal were KARR and KMWX in WA on 1460. By the time we had to roll in the wires, most of the signals were gone, though.

And from the log

The results were astounding, and speak well for themselves. Here is a cut-and-paste of their log with some of the highlights (**Table 1**). I was quite surprised to find a few stations from my home state of Washington included.

All in all I would say that they had a most successful outing. Wow, what an understatement! If you have access to the Internet, I suggest that you check out the DXLC Web page and get the full story. There are a number of striking color photos of that beautiful portion of Norway. You will also find more comprehensive details on the logs and the events, as well as some general information about MW DXing in Scandinavia. The URL is [http://www.dxlc.com/kong4/]. I hope you will check it out.

And now the news ...

Here is a note from Bernie W3UR, that he received from Juan Carlos, CX7CC: Radio Grupo Sur (RGS) offers an award to celebrate the year 2000. Two special callsigns — CX2000 on phone and CW2000 on CW and digital modes (packet, PSK31) — will be in the air from January 1st.

Rules: Hams from Argentina, Brazil, and Uruguay must work the special stations on three bands and/or modes. The rest of the world must work the special calls on two bands and/or modes. The award is also open for SWL. All QSLs will be confirmed. To claim the award, send a list and 5 IRC or 5 \$US to the RGS Award Manager, P.O. Box 2 - CP 11000, Montevideo, Uruguay, South America. Official RGS station CVC2000

will be active in CB. Three contacts with it must be done on three different days. To claim the award, send a list with the contacts and 5 IRC or 5 \$US to the BC2000 Award Manager, c/o the RGS address above. RGS members need send only an SASE 22 x 30 cm for either of these awards.

Just in case you didn't hear about the following one, I'll pass along the press release that I received from John N7CQQ back in January:

N7CQQ Amateur Radio Club, Inc. sponsor of the Clipperton2000 expedition is very happy to announce that Icom America is sponsoring the DXpedition to Clipperton Island. Icom America will provide the new IC-756PRO for the Clipperton team members to use while on the expedition. Our thanks goes out to Mr. Ray Novak, National Sales Manager for Icom America.

Clipperton2000 is scheduled to depart San Diego, California USA on 23 February 2000. The team will be ready to operate on 1 March 2000 from Clipperton Island. We plan to have four (4) HF stations, one (1) 6 meter station and one (1) satellite station. We also plan to operate RTTY and the WARC bands from Clipperton. The DX-pedition will shut down late on 8 March 2000 and depart Clipperton 9 March. Additional information on the expedition can be found at [www.qsl.net/clipperton2000]. Additional information about the Icom IC-756PRO can be found at [www.IcomAmerica.com].

And this just in from one of our UK friends, Phil G3SWH, concerning an IOTA run to Wasini Island in Kenya (IOTA AF-67). (We expect lots of pictures, Phil!)

We have a team of six experienced DX operators: Jim G3RTE, David G3UNA, Phil G3SWH, Rob 5Z4RL, Ian 5Z4IC, and Graham 5Z4GS. We plan to be active between 8th and 16th March 2000 with two stations, one on CW and the other on SSB on a 24-hours-a-day basis, using the special callsign of 5Z4WI. Propagation permitting, we expect to operate on all bands from 160 to 10 meters, with the exception of 30 meters, which is not presently permitted in Kenya. We have an expedition target of 15.000 QSOs. Wasini has been activated only once before, for a 24-hour period in the 1993 IOTA Contest.

Pulling the switch

So much for this month's introductory installment of the DX Forum. Next month, it's time to get down to business. Oh, and before I forget, don't miss the DX pedition to Clipperton. In coming installments we will have an interview with one of the folks

at Icom concerning their sponsorship of this event. I will also be talking with Len Westbo W7MCU, who will provide insight as to how he approaches his duties as a QSL checker for DXCC.

In the meantime, if you would like to contribute material or news items, or would like to sound off in the "Vox Populi" segment of this column that will be inaugurated perhaps as soon as next month, you can E-mail or snail-mail me at the addresses above. 73 and good DX!!

The Quest for Super Sounding Audio continued from page 14

Modern transceivers with this capability include Kenwood's TS-570, 870, and 950; Yaesu's FT-1000; Icom's IC-706 and 746; and Kachina's 505. Details are in their operating manuals. Just remember to monitor your actual transmitted signal with a wideband receiver when making changes.

Earlier, I mentioned that some transceivers have different transmit and receive bandwidths (and a couple even have 3.1 kHz bandwidth). When combined with a wide range mike like Heil's GoldLine, the resultant audio can really knock your socks off. Collins' famous KWM-1 transceiver utilizes a 3.1 kHz mechanical filter, and its on-the-air sound is marvelous. Icom's IC-761 uses different transmit/ receive bandwidths. On receive, several filters give selectable bandwidths of 2.2 and 2.7 kHz. On transmit, fewer and wider-width filters give a bandwidth of 3.1 kHz. Newer style and more fancy-looking transceivers are quite appealing, but I personally cannot find another rig comparable to my dear IC-761.

Audio equalizers

Taking a lesson from recording studios and large church audio systems, some big-time audio enthusiasts are integrating professional-grade audio equalizers into their stations (**Photo D**). These equalizers have fully adjustable low, mid-, and high ranges that can be set to accentuate your personal voice characteristics while minimizing

sizzled S's and popped P's. Further, switch selection of various channels gives one or two connected microphones the ability to produce many different sounds such as "double level bass," reverb, etc.

An alternate and less expensive approach to the recording studio-type setup, and a unit especially designed to work interchangeably with KenYaeCom rigs and mikes (plus Heil mikes with KenYaeCom cables), is the W2IHY dual channel audio equalizer and noise gate shown in Photo E. This little tyke has separate bass and treble controls so that you can have a big bass sound when signal paths are good, or emphasize high tones for weak signal work or DXing. The W2IHY equalizer is available in kit or preassembled form from Julius Jones W2IHY, 19 Vanessa Lane, Staatsburg NY 12580; telephone (914) 889-4933.

One final thing to ponder: Remember those classic SSB phasing-type transmitters? They shifted an unwanted sideband 180 degrees in phase instead of removing it with a narrow crystal filter. Super sounding audio galore! Now, that should set fleamarket traders and rig restoring enthusiasts reeling and rocking!

Salvage Special: TV/VCR Tuner Receiver continued from page 20

Of course, the reason for the low audio amplitude recovery is that the audio signal deviation for TV audio is 25 kHz, while hams and most public service operations use 5 kHz deviation. Making the deviation recovery slope steeper would increase the amplitude of the recovered audio level. The desire to change the detector's slope leaves room for further experimentation.

A down side to the project is that the new local oscillator signal will create harmonics that are tunable all the way up the tuning range. Although the harmonic signal is present, I've not found it to be very objectionable in my applications.

The potential for adjacent channel signal interference is present when two

or more channels occur simultaneously. The reason for interference is that the 4.5 MHz IF passband is about 130 kHz in support of TV audio, and the wide channel allows adjacent channels to pass through to the detector.

Conclusion

I found the TV/VCR receiver project to be interesting and very challenging. Only those challenges have been discussed that specifically enable you to get started on an educational journey of discovery. There are an abundance of challenges waiting ahead. Get on the experimenter's bandwagon, salvage a VCR, and get moving!

The Care and Feeding of NiCds

continued from page 22

so that the current is still about 1–2 percent of the rated battery current. What we are doing is setting the trickle charge current to the internal resistance of a fully charged battery or pack.

To test the circuit, attach any kind of small load to the battery for just a few seconds. Now turn on the charger again and watch the current. You should see the current go up, to something less than the maximum of the power transformer and the regulator. It will slowly taper back down to the safe 1 to 2 percent of the rated battery capacity. The transformer, regulator, and proper setting of R2 will result in an automatic charger that will give you some fast charge in the beginning and a safe trickle charge that you can maintain connected forever.

Secrets of Transmission Lines continued from page 28

The transformer T1 is a bifilar-wound toroid. It is not critical. It only needs to present an open circuit reactance of about +j500 ohms at the lowest frequency you intend to use. I have used a Ferronics 11-220-K core (μ = 125) about 3/8-inch in diameter and 3/32-inch thick with 40 bifilar turns of #30

enameled wire. It measured about 74 µH per side at 1 to 4 MHz.

The bridge is a fixed Wheatstone type that has the antenna as one leg. When the antenna looks like 50 + j0 ohms, the bridge output voltage as measured at B falls to zero. For all VSWRs below about 2:1, the voltage at B is lower than the forward voltage sample at A. The meter for reading voltages A and B should have an impedance no higher than 10k. A voltage comparator and an LED can compare the voltages A and B and light whenever the VSWR is less than 2:1.

In operation, the relay is flipped into the "tune" position and the transmitter keyed. With only a few milliwatts radiating, the tuner is tuned until the voltage at B is nulled. The transmitter is unkeyed and the relay switched to "run." Your fellow hams will thank you for the micro power tune-up.

Please feel free to use the two GWBASIC programs provided in this article. Due to their short length they are easy to key in if you are interested.

CALENDAR EVENTS

continued from page 38

orders must be received by March 1st. Please send an SASE.

MAR 26

MADISON, OH The Lake County ARA will hold its 22nd annual Hamfest/Computerfest, 8 a.m.–2 p.m. at Madison High School on North Ridge Rd. in Madison OH. New and used amateur radio, computer and various other types of electronic equipment will be featured. The hamfest will also feature craft demonstrations and VE exams. Admission \$5 at the door. 6 ft. tables \$8, 8 ft. tables \$10. To make table reservations call *Roxanne at (440) 257-0024*.

APR 1

WATERFORD, CT The Radio Amateur Society of Norwich will hold their Ham Radio Auction at the Waterford Senior Center on Rt. 85. From Hartford, take Rt. 2 South to Rt 11 to Rt 85 South. From the Shoreline, take Rt. 95 to Rt. 85 North. Talk-in on 146.730(-). Bring your gear to sell (10% commission to RASON). Free admission, free parking. Contact Tony AA1JN at (860) 859-0162, or see the RASON Web page at [www.rason.org].

HAMSATS

continued from page 43

Tuning during the pass

Another concern is Doppler shift. Satellites in Low Earth Orbit (like AO-27) travel fast enough to cause apparent frequency shift for an observer on the ground at VHF, and especially UHF frequencies. At the beginning of the pass, the satellite downlink will "appear" to be as much as 10 kHz above 436.797 MHz. Set the HT to 436.810 MHz. When the satellite is at TCA, the frequency should be set to 436.800 MHz. As the satellite progresses to the south, tune down to keep received signals clear.

For the uplink, little or no frequency adjustment is required. Doppler shift on two meters is one third that on 70cm. While the downlink will seem to move as much as 20 kHz during the course of the pass, the uplink "drift" is only about 6 kHz. The FM receiver in the satellite will keep up with this much frequency shift.

Get on the air!

With the tracking chart in this issue of 73, your HT, long whip antenna, speaker/mike, and earphone or earbud headphones, you're ready to make AO-27 contacts. Listen for the satellite. When it sounds good, try transmitting. Don't transmit unless you have good reception. Try weekdays first. The satellite is very crowded on weekends. While the satellite "regulars" try to give the portable and mobile stations priority, weekends are a problem. Imagine a repeater with a coverage area of North America! It's quite an experience just to hear the activity on AO-27. Try it!

I will be trying out the new MFJ whips during March on my 5 W HT. Listen for me on the listed passes. Next time, we'll look at other antenna options and another great FM satellite, SO-35.

ON THE GO

continued from page 47

interesting QSL cards with your local club newsletter (indicating when and where the next ham classes are scheduled, of course), you're in business.

Think of your portable rig as a powerful "show and tell" tool. It should be as important as a sample case is to a salesman or a Bible is to a missionary. Now, go fire up your own mobile or portable rig out there and get somebody excited about ham radio!

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ORP

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not need radials, I did not have to worry about connecting them to the two pipes. However, if you need to use radials, it should be an easy job with some heavy copper braid.

Getting the most out of your QRP signal requires lots of work with the small things that most hams over look. Take care to make your antenna farm the best you can. The results will just amaze you!

THE DIGITAL PORT

continued from page 53

these rigs had come when Les WA7HAM had written wondering if the Pegasus he had on order was going to work PSK31. It seemed, as I looked at the ads, that it should, so I E-mailed Ten-Tec and they claimed to be doing it just fine at the factory, but no details.

Then I found a ham who was just going through the initial setup with one, and he assured me he had gotten PSK31 working. My concern was having the tuning indicator visible while operating the radio from the same computer monitor. It seems the PSK31 tuning window manages to stay on top of whatever other window is on the screen and all is well.

It sounds as though Ten-Tec has excellent acceptance of this new product. One ham tells me that the waiting list is at least three months. Another comment I received was that the radio seemed to be made for the digital modes. At the advertised \$895 price, it certainly is worth a look.

More toys found

As I search ham-related subjects, I come across ideas that are new to me more often than I remember. I will have to start a list so that I can run through it a bit at a time and tell you what I have found. That sounds like the goal of a procrastinator's club, but I just ran across a couple of links on the Internet while I was verifying URLs for this article that I had completely forgotten.

There are many good, ham-related ideas out there, and they are valuable to some of us. If there was no value, they wouldn't have been developed. We simply need to sort them out.

If you have questions or comments about this column, E-mail me at [jheller@ sierra.net] and I will gladiy share what I know or find a resource for you. For now, 73, Jack KB7NO.

ORX

continued from page 6

passenger's seat belt was buckled. She noticed that one passenger wore one earplug while fiddling with a black box having wires running out the back. Strange!

She QSP'd her findings to the rest of the crew as we sensed that the aircraft began to fly in a big generous arc. We experienced an unscheduled landing in Dallas and were herded into a basement room while a ground crew took the airplane apart.

The fate of my keyer was in guestion. Hey, I could be getting in some practice! But having once worked for American Airlines and also the FAA, I knew they were just following regulations.

Eventually the flight continued and my keyer was returned unscathed, amid others muttering about "missing my connection," et cetera.

One lasting lesson was learned: Never inject any even slightly black box into the mix, for you will surely pay dearly in lost time.

Thanks to Gene Brizendine W4ATE, 600 Hummingbird Lane SE, Huntsville AL 35803-

NEVER SRY DIE

continued from page 45

today can be amazingly realistic. I had the opportunity to sit in the cockpit of a C5B (like a 747) to do takeoffs and landings at airports all around the world and under all kinds of weather conditions, including 100-foot visibility fog when I was coming in to land at Honolulu. The simulator even let me feel every rough spot along the runway.

But imagine being able to learn algebra from a teacher who actually makes it fun to learn, complete with any kind of graphics that would help get the concepts across, and being able to do this in the afternoon after having visited the Taj Mahal or climbed a part of the Great

Wall of China, or visited the terra cotta army recently uncovered at Xian in China! No one can understand how fantastic the Taj Mahal is until they've seen it up

How will the world react to millions of American goodwill ambassadors visiting their countries? And, in return, having their children able to see Disneyland, Epcot Center, Times Square, Coney Island, Branson, Las Vegas, the Grand Ol' Opry, the Grand Canyon, and so on? I'll bet we'd get a bunch to see New Hampshire's sights such as the Old Man of the Mountains, the Cannon Mountain tramway, the Mount Washington Cog Railway, and so on.

And all of this needn't cost as much as our present horribly inefficient public school system, with its antiquated curriculum, out-of-date textbooks, poorly trained teachers, run-down buildings, and large classes.

When kids are able to learn about what interests them instead of what is jammed down their throats, with the memorizing of facts in order to pass exams as the goal instead of understanding and dealing with new concepts, we're going to see a new America gradually develop. And then a whole new world as our pioneering approach is emulated. Well, America has always been a pioneering country, so what's new about that?

Kids should have the experience of visiting Rome, Paris, London, Berlin, Vienna, Budapest, Moscow, Nairobi, Johannesburg, Agra, Xian, Baghdad, Damascus, Stockholm, Madrid, and even Kuching and Bandar Seri Begawan. Let's not forget the lost city of Petra in Jordan, the pyramids in Egypt, a trip up the Amazon, the ruins of Athens, and scuba diving the Caribbean island reefs.

Can we do this by 2020? Why the hell not? But I can't make all this happen

Continued on page 64



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Jim Gray W1XU/7 210 E Chateau Payson AZ 85541 [jimpeg@netzone.com]

March may represent "... the best of times and the worst of times ..." as Dickens began The Tale of Two Cities. HF propagation is anticipated to be good, even exceptional, during the first two weeks and the last week of this month, but it's the third and fourth week we have to watch out for, and here's why.

March — the month of the Spring equinox in the northern hemisphere — usually features better-than-average propagation on the HF bands and may be expected to do so this year, when Sunspot Cycle 23 is likely to peak.

However, during the peak of any sunspot cycle, huge sunspots, solar flares, and other phenomena become very pronounced, greatly disturbing the Earth's magnetic field, causing excessive ionization of the ionosphere and occasionally disrupting HF-band communications for days at a time. On such occasions, Earth's electric power distribution systems, and satellites with their vulnerable semiconductors, can be disrupted.

The days of March 14th-16th, but more likely the 20th–25th, may exhibit this kind of exceptional solar activity, accompanied by large geomagnetic-field disturbances, and possibly intense atmospheric and other geological upsets. Be prepared.

General band-by-band forecast

10 and 12 meters

Fairly regular DX may be expected on Good (G) days to Europe and the east before noon, and to Africa shortly after noon. Also, you may find good band openings to South America, the Pacific, and the southern hemisphere during the afternoon. Short skip between 1,000 and 2,000 miles during the day is anticipated for most days.

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Fun, easy to build projects for publication in 73. For more info, write to: Joyce Sawtelle, 73 Amateur Radio Today, 70 Hancock Road Peterborough NH 03458.

15 and 17 meters

You can look for excellent daytime DX to the southern hemisphere and to most areas of the world, peaking to Europe before noon and to most other areas of the world during the afternoon; daytime short

skip beyond 1,000 miles will be frequent.

20 meters

Excellent DX openings to most areas of the world are expected on Good (G) days

from local sunrise until long after sunset. Peak conditions should occur an hour or two after sunrise and again in the late afternoon. On Good (G) days, DX into the southern hemisphere can be worked during the hours of darkness as well. Short skip from 500 to over 2,000 miles is anticipated on most days.

30 and 40 meters

These may be your best DX bands from local sunset until sunrise, when you can expect frequent openings and often strong signals into the southern hemisphere. Daytime short skip to about 1,000 miles is expected, and beyond 750 miles after dark.

80 and 160 meters

	March 2000						
SUN	MON	TUE	WED	THU	FRI	SAT	
			1 F	2 F-G	3 G	4 G	
5 G	6 G	7 G	8 G	9 G	10 G	11 G	
12 G-F	13 F-P	14 P-VP	15 VP	16 P	17 P-F	18 F	
19 F-P	20 P	21 P-VP	22 VP-P	23 P-VP	24 VP	25 VP-P	
26 P-F	27 F	28 F-G	29 G	30 G	31 G		

can be expected from local sunset through the darkness hours on Good (G) nights, limited of course by thunderstorm static on some paths. Short skip at night will extend between 1,000 and 2,000 miles.

		E/	STE	RN U	NITE	D ST	ATES	TO:				
GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	10/12		20		[i	17/20	20			15/17	10/12
ARGENTINA	15/17	15/17	20	30/40	30/40			10/12			12/15	12/15
AUSTRALIA	10/12	17/20	20	20	20	30/40	30/40	17/20				10/12
CENTRAL AM.	15/17	17/20	17/20	17/20	17/20	15/17	15/17	10/12	10/12	10/12	17/20	10/12
ENGLAND	17/20	30/40	40/80	40/80	30/40			15/17	10/12	15/17	15/17	17/20
HAWAII	10/12	12/15	17/20	17/20	20/30	20/30	17/20	17/20				10/12
INDIA	17/20	17/20			_			15/17				
JAPAN	10/12		17/20				17/20	17/20			15/17	10/12
MEXICO	12/15	20/40	20/40	20/40	20/40	15/17	15/17	10/12	10/12	10/12	17/20	10/12
PHILIPPINES	15/17		17/20	17/20			17/20	15/17	10/12			15/17
PUERTO RICO	15/17	17/20	17/20	17/20	17/20	15/17	15/17	10/12	10/12	10/12	17/20	10/12
RUSSIA (C.I.S.)	30/40	30/40	17/20	17/20				10/12	10/12	12/15	17/20	17/20
SOUTH AFRICA	20/30	40	20/30	20/30					10/12	10/12	12/15	12/15
WEST COAST	20/30	20/30	20/30	30/40	30/40			10/12	10/12	10/12	15/17	17/20
		CE	NTR	AL U	NITE	D ST	ATES	то:				
ALASKA	10/12	12/15	17/20	17/20	20		17/20	17/20		_		10/12
ARGENTINA	15/17	15/17	20/30	20/30	17/20		İ	10/12			10/12	12/15
AUSTRALIA	10/12	15/17	15/17		17/20	20/30	30/40	17/20			12/15	10/12
CENTRAL AM.	15/17	15/17	17/20	17/20	20/30			10/12	15/17	10/12	10/12	10/12
ENGLAND	30/40	30/40	30/40						12/15	12/15	17/20	17/20
HAWAII	12/15	15/17	15/17	17/20	17/20	20/30	30/40	17/20		10/12	12/15	12/15
INDIA	15/17	17/20						12/15	12/15		\Box	
						 	1			_	-	

AUSTRALIA	10/12	15/17	15/17		17/20	20/30	30/40	17/20			12/15	10/12
CENTRAL AM.	15/17	15/17	17/20	17/20	20/30			10/12	15/17	10/12	10/12	10/12
ENGLAND	30/40	30/40	30/40						12/15	12/15	17/20	17/20
HAWAII	12/15	15/17	15/17	17/20	17/20	20/30	30/40	17/20		10/12	12/15	12/15
INDIA	15/17	17/20						12/15	12/15			
JAPAN	10/12	12/15	17/20	17/20	17/20		17/20	17/20				10/12
MEXICO	10/12	15/17	17/20	17/20	17/20			10/12	10/12	10/12	12/15	12/15
PHILIPPINES	10/12		15/20	17/20					10/12	10/12		
PUERTO RICO	15/17	15/17	20/30	20/30	20/30			10/12	10/12	10/12	10/12	10/12
RUSSIA (C.I.S.)								12/15	12/15	12/15	17/20	17/20
SOUTH AFRICA			17/20	17/20					12/15	12/15	15/17	17/20
		WE	STE	RN U	NITE	D ST	ATE	S TO:	-			
ALASKA	10/12	10/12	15/17	17/20	17/20	17/20		17/20	17/20			15/17

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	12/15	15/17	17/20	30/40				10/12	10/12	10/12	12/15
7/20	17/20							15/17	15/17	17/20	17/20
0/12	10/12	12/15	15/17	20/30	20/30	30/40		12/15	10/12		
	15/17	17/20						12/15	15/17		
0/12	10/12	12/15	17/20	17/20	17/20			17/20			15/17
0/12	12/15	15/30	17/30	20/30				10/12	10/12	10/12	12/15
0/12	10/12					-	17/20	15/17	17/20		
0/12	12/15	15/30	15/30	17/30				10/12	10/12	10/12	12/15
7/20				17/20			17/20	17/20	20	20	20
7/20	-20		20						10/12	12/15	12/15
0/30	20/30	30/40	30/40	30/40			10/12	12/15	12/15	15/17	17/20
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Table 1. March Band-Time-Country chart. The higher band will Worldwide DX | be useful on Good days. Otherwise, use the lower band shown.

Here are some of my books which can change your life (if you'll let 'em). If the idea of being healthy, wealthy and wise interests you, start reading. Yes, you can be all that, but only when you know the secrets which I've spent a lifetime uncovering.

.....Wayne

The Bioelectrifier Handbook: This explains how to build or buy (\$155) a little electrical gadget that can help clean the blood of any virus, microbe, parasite, fungus or yeast. The process was discovered by scientists at the Albert Einstein College of Medicine, quickly patented, and hushed up. It's curing AIDS, hepatitis C, and a bunch of other serious illnesses. The circuit can be built for under \$20 from the instructions in the book. \$10 (01)

The Secret Guide to Wisdom: This is a review of around a hundred books that will help you change your life. No, I don't sell these books. They're on a wide range of subjects and will help to make you a very interesting person. Wait'll you see some of the gems you've missed reading. \$5 (02)

The Secret Guide to Wealth: Just as with health, you'll find that you have been brainwashed by "the system" into a pattern of life that will keep you from ever making much money and having the freedom to travel and do what you want. I explain how anyone can get a dream job with no college, no résumé, and even without any experience. I explain how you can get someone to happily pay you to learn what you need to know to start your own business. \$5

The Secret Guide to Health: Yes, there really is a secret to regaining your health and adding 30 to 60 years of healthy living to your life. The answer is simple, but it means making some difficult lifestyle changes. Will you be skiing the slopes of Aspen with me when you're 90 or doddering around a nursing home? Or pushing up daisies? No, I'm not selling any health products. \$5 (04)

My WWII Submarine Adventures: Yes, I spent from 1943-1945 on a submarine, right in the middle of the war with Japan. We almost got sunk several times, and twice I was in the right place at the right time to save the boat. What's it really like to be depth charged? And what's the daily life aboard a submarine like? How about the Amelia Earhart inside story?If you're near Mobile, please visit the Drum, \$5 (10)

Wayne's Caribbean Adventures: My super budget travel stories - where I visit the hams and scuba dive most of the islands of the Caribbean. You'll love the special Liat fare which let me visit 11 countries in 21 days, diving all but one of the islands, Guadeloupe, where the hams kept me too busy with parties. \$5 (12)

Cold Fusion Overview: This is both a brief history of cold fusion, which I predict will be one of the largest industries in the world in the 21st century, plus a simple explanation of how and why it works. This new field is going to generate a whole new bunch of billionaires, just as the personal computer industry did. \$5 (20)

Cold Fusion Journal: They laughed when I predicted the PC industry growth in 1975. PCs are now the third largest industry in the world. The cold fusion ground floor is still wide open. but then that might mean giving up watching ball games. Sample: \$10 (22).

Julian Schwinger: A Nobel laureate's talk about cold fusion—confirming its validity. \$2 (24)

Improving State Government: Here are 24 ways that state governments can cut expenses enormously, while providing far better service. I explain how any government bureau or department can be gotten to cut its expenses by at least 50% in three years and do it cooperatively and enthusiastically. I explain how, by applying a new technology, the state can make it possible to provide all needed services without having to levy any taxes at all! Read the book, run for your legislature, and let's get busy making this country work like its founders wanted it to. Don't leave this for "someone else" to do. \$5 (30)

Mankind's Extinction Predictions: If any one of the experts who have written books predicting a soon-to-come catastrophe which will virtually wipe us all out are right, we're in trouble. In this book I explain about the various disaster scenarios, from Nostradamus, who says the poles will soon shift, wiping out 97% of mankind, to Sai Baba, who has recently warned his followers to get out of Japan and Australia before December 6th this year. The worst part of these predictions is the accuracy record of some of the experts. Will it be a pole shift, a new ice age, a massive solar flare, a comet or asteroid, a bioterrorist attack, or even Y2K? I'm getting ready, how about you? \$5 (31)

Moondoggle: After reading René's book, NASA Mooned America, I read everything I could find on our Moon landings. I watched the videos, looked carefully at the photos, read the astronaut's biographies, and talked with some of my readers who worked for NASA. This book cites 25 good reasons I believe the whole Apollo program had to have been faked. \$5 (32)

Classical Music Guide: A list of 100 CDs which will provide you with an outstanding collection of the finest classical music ever written. This is what you need to help you reduce stress. Classical music also raises youngster's IQs, helps plants grow faster, and will make you healthier. Just wait'll you hear some of Gotschalk's fabulous music! \$5 (33)

The Radar Coverup: Is police radar dangerous? Ross Adey K6UI, a world authority, confirms the dangers of radio and magnetic fields. \$3 (34)

Three Gatto Talks: A prize-winning teacher explains what's wrong with American schools and why our kids are not being educated. Why are Swedish youngsters, who start school at 7 years of age, leaving our kids in the dust? Our kids are intentionally being dumbed down by our school system - the least effective and most expensive in the world. \$5 (35)

Aspartame: a.k.a. NutraSweet, the stuff in diet drinks, etc., can cause all kinds of serious health problems. Multiple sclerosis, for one. Read all about it, two pamphlets for a buck. (38)

One Hour CW: Using this sneaky method even you can learn the Morse Code in one hour and pass that dumb 5wpm Tech-Plus ham test, \$5 (40) Code Tape (T5): This tape will teach you the letters, numbers and punctuation you need to know if you are going on to learn the code at 13 or 20 wpm. \$5 (41) Code Tape (T13): Once you know the code for the letters (41) you can go immediately to copying 13 wpm code (using my system). This should only take two or three days. \$5 (42)

Code Tape (T20): Start right out at 20 wpm and master it in a weekend for your Extra Class license. \$5 (43)

Wayne Talks Not at Dayton: This is a 90-minute tape of the talk I'd have given at the Dayton, if invited. \$5 (50) Wayne Talks at Tampa: This is the talk I gave at the Tampa Global Sciences conference. I cover cold fusion, amateur radio, health, books you should read, and so on. \$5 (51)

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1998 Editorials: 168 pages that'll give you lots of controversial things to talk about on the air. \$10 (75)

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2000 Editorials: In the works.

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sive state government, etc. \$1 (85) Stuff I didn't write, but you need:

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Make your list, count the words, including your call, address and phone number. Include a check or your credit card number and expiration. If you're placing a commercial ad, include an additional phone number, separate from your ad.

This is a monthly magazine, not a daily newspaper, so figure a couple months before the action starts; then be prepared. If you get too many calls, you priced it low. If you don't get many calls, too high.

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Send your ads and payment to: 73 Magazine, Barter 'n' Buy, 70 Hancock Rd., Peterborough NH 03458 and get set for the phone calls. The deadline for the June 2000 classified ad section is April 10, 2000.

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NEVER SRY DIE

continued from page 61

alone. The monkey is on your back to break the present system and get us into the 21st century and out of the 19th, schoolwise.

Let's get rid of the regimented schools of today and let kids learn what they want, without any tests, grades, and so on. If they choose not to learn, that's their prerogative and they'll pay the price. No more K-12 or high school, since kids won't be segregated by grades and age. If a ten-year-old wants to learn calculus, why not?

Colleges are going to have to reinvent themselves, too. They're going to have to come down out of their ivory towers and provide practical, useful education, with a heavy emphasis on entrepreneurialism if they want to stay in business.

So, let's set our sights on American education in 2020, where our technological revolution will make it possible to totally revamp our whole school system. There are opportunities for thousands of new companies to get involved. We need a thousand or so interactive and fun teaching programs. We need to build mobile laboratories. We need to organize student tours all around the world.

Hey, wake up!

73

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THE NEW!

73 Amateur Radio Today

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ORX . . .

Partial Callsigns: What the FCC Rules Say

In a letter to net control operator Alan Strauss WA4JTK, and later on the RAIN Report, the FCC's Special Counsel for Amateur Radio Enforcement, Riley Hollingsworth K4ZDH, has stated that if only the last two letters of a callsign are given, that station identification doesn't meet the requirements of the Amateur Service Part 97 Rules. Hollingsworth also

pointed out that if a calling station using an abbreviated callsign suffix is never acknowledged and given a chance to give a complete callsign, a legal station identification would be lacking for that communication.

This report brought a flurry of cheers from many DXers who have been fighting the partial callsign problem for years. But it has also been very controversial with some other DX operators, some contest

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NEUER SAY DIE

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It's Spring!

The wildflowers are starting to bloom in the north pasture. The FCC, despite the ARRL (or was it to spite the ARRL?), virtually eliminated the Morse Code barrier to licenses, and they also okayed low power FM stations.

Things Are Looking Up!

First, the flowers. I'll be out there with my new Sony digital camera snapping close-ups of the profusion of New Hampshire wildflowers as they bloom and putting them on my Web site so that you can eat your heart out.

Second, business has already picked up for my One Hour 5 WPM Code book. Actually, if you follow my instructions, it shouldn't take you more than to half-hour of study to be able to pass the 5 wpm test. I used that system when I was a Boy Scout, and it took me 20 minutes.

My book also explains the simplest way there is to learn to copy code at higher speeds, without weeks of traumatic practice.

Third, low-powered FM stations present a golden opportunity for a few hams with initiative. Somewhere around a thousand small organizations are going to want to get involved, and they aren't going to know diddly about how to go about it.

They're going to need a transmitter, antenna, operating console, microphones. CD and tape players, telephone connections for on-the-air interviews, a delay system for ditto, and so on. They'll need installation and maintenance. If they're going to pick up any programming from satellite feeds, they'll need the equipment for that. They may even want to build a small studio. They'll also need handholding on getting their license. I doubt it'll be long before special equipment is available for this market.

Your Help

I'd like to get more hams to like that spread the magazine, and you can the world.

help. I love getting phone calls, E-mail, and letters from readers who enjoy the magazine and my editorials. But subscription letters to nonsubscribers with my telling them this won't mean much. However, if I could include a testimonial from you explaining how much you enjoy the magazine, or even how I've helped change your life, that might be more compelling.

There are over 600,000 hams out there who have no idea how much fun the magazine is, How it can help them get a lot more fun out of the hobby, or how my editorials might help them to live healthier, more successful lives. If we can get even a sixth of them to subscribe, you'll see the fattest ham magazine in the world, packed with advertising and tons of interesting articles. I'd love to publish a DXpeditionof-the-month article. And a continuing series explaining how newcomers can get involved with packet, satellites, slow scan, RTTY, foxhunting, and so on. I'd love to include book sections, as I have in the past. I ran a coax handbook in the magazine that became a standard reference manual for years. I'd love to include a VHF antenna handbook, and so on.

Then there's my old ad sales manager W7DXX, now in business with a Kachina rig interfaced with the Internet so anyone with the access code (yes, you have to be licensed) can get on the air, tune the band, and rotate his beam. His first user was a ham in Singapore! I'd love to publish a hundred articles explaining how you can do mischief like that.

Remember, anyone can talk over your rig as long as you're "in control." But the FCC regs don't explain what "in control" means. At the very least, interfaces such as DXX's will enable Techs to get on the air and work some rare DX. I'll bet we'll have remote base stations like that springing up all around



So, please give me a hand. If you're enjoying my present thin magazine, you're going to go wild over it when we get it fattened up like it used to be. Heck, we used to run 200 pages and more, and we can again — with your help.

Send your letters to Wayne Green, Box 700, Antrim NH 03440, or E-mail me at w2nsd@aol.com.

Beck, et al.

Since I can't get you to record the Art Bell show, you missed hearing Bob Beck being interviewed about his blood purifier. Tsk. I've published two construction articles on this device in 73, calling it the Bioelectrifier. The back issues sold out instantly, but you can get a reprint, along with a history of the blood purifier, from my ad on page 63.

The process was discovered serendipitously by Drs. Lyman and Kaali of the Albert Einstein College of Medicine ten years ago. Dr. Kaali has gotten three patents on the process, yet little word of their discovery has ever been released.

As Beck reported, Dr. Kaali's patent application claimed that the process of passing a microcurrent through the blood would eliminate any virus, microbe, yeast, parasite, or fungus — including HIV. In trials with a local hospital, the Bioelectrifier was curing AIDS and a wide variety of other illnesses. Even cancer!

I've been making Bioelectrifier information available for over six years, and the letters of thanks I've been getting make the effort worth it. I only wish I could let more people know that cancer has been easily and inexpensively cured. I've reliable reports of emphysema and a host of other illnesses being resolved.

Well, it makes sense, as I've

written many times. If you clean viruses, microbes, and so on out of your blood, your immune system will be better able to rebuild itself, and it's the immune system that's doing the real work.

But through the lifestyles we inherit from our parents and grandparents, which are reinforced by our media, we're poisoning our bodies, denying ourselves the nutrition we are designed to need, giving ourselves far too little pure water, sunlight, and exercise, and too much stress. Talk about throwing monkey wrenches into the machinery!

Drs. Kaali and Lyman both refused to be interviewed for the show.

Is it really possible that there's an inexpensive cure for AIDS and cancer that the medical industry is trying to hide? Just follow the money, my friend.

An outfit started selling plant growth stimulators, which have the same circuit as the Bioelectrifier, from Colorado, but the FDA forced them to move to Canada, where the device is not yet illegal to sell. There's still one source in the U.S., but it too may have to move to Canada. The Colorado company sells a kit for \$100; Butterfly Products has a completely built plant growth stimulator, all ready to make your plants grow like crazy, for \$155 ppd., and it comes with silver wires for making silver colloid as a bonus. You can, at least for now, order it from Box 1729, Hillsboro NH 03244.

If you want to stop missing critically important Art Bell shows like this one, start recording it on your VCR every night so that you won't miss the better shows. For \$5, you can get Wayne's Bell Saver Kit, which has the necessary patch cable and instructions. Art's show, which runs from 10 p.m. to 3 a.m. PST, mainly attracts

Number 6 on your Feedback card

continued from page 1

operators, and the control stations for numerous foreign DX spotting nets. Some of the control operators for these nets are very vocal in opposing full callsigns. They say that a full callsign wastes time. And there are even reports that some overseas net operators are turning away US stations that try to sign in using their full calls.

But the bottom line is that hams in the United States are not regulated by the DX operators government. Rather, United States hams fall under the guidance of the FCC. It is the FCC that has determined how and how often a United States license holder must identify. It's covered under Part 97.119(a) of the United States Amateur Service Rules. It's also something that all US hams are supposed to know, and it reads as follows:

"Each amateur station, except a space station or telecommand station, must transmit its assigned callsign on its transmitting channel at the end of each communication, and at least every ten minutes during a communication, for the purpose of clearly making the source of the transmissions from the station known to those receiving the transmissions. No station may transmit unidentified communications or signals, or transmit as the station callsign, any callsign not authorized to the station."

The operative words appear to be the reference to identifying at the end of a transmission. Also identifying every ten minutes if a single transmission exceeds that length of time.

By way of example: Suppose you call another station, or sign into a net, using only the last two letters of your call. You are acknowledged but never given a chance to make another transmission. As a result, you have violated section 97.119(a).

To make your transmission legal, you must find a way to properly identify at some point in the communication with complete call. And — in the heat of the battle for a rare DX contact or in dealing with some non-US nets, that might not be so easy.

Thanks to Robert Sudock WB6FDF, reporting in Newsline, Bill Pasternak WA6ITF, editor.

Ishmod 2000

After our update on Ishmod Kaduk S7Z2B last year, word has continued to filter in to our New Hampshire offices with news about possible sightings or further information about the hard-luck DXer. Readers may recall that while on a DXpedition in the South China Sea in 1963, Kaduk and his four companions vanished shortly after stumbling across some kind of different propagation phenomena. Or pirates. (The complete story can be found in our April 1984 and April 1985 issues.)

Last year, we were pleased (and astonished) to report two possible sightings of Ishmod during

the civil unrest in Indonesia, but apparently further investigation in that country has proved fruitless.

Nonetheless, since last spring we have received three further bits of news that we ask readers to follow up on if at all possible, while we continue to do the same. It seems that April is always the time to report on this to you.

First, the waters off Chilka Lake, the district of India from which the DXpedition departed, apparently were mentioned at least once last year on the syndicated Arch Bell radio show. We are looking into that.

Also, it turns out that the exact location of the phenomena/disappearance, "200 air miles south of Calcutta," along with a description of radio wave behavior there, may be mentioned in the book *Area 51: Personal Stories* by Lt. Col. Ruben Barnett (USAF, Ret.). Several readers who have sought this book report that it mysteriously disappeared from booksellers' shelves about four years ago. If anybody has a copy, we would sure like to see it here at 73.

Finally, we have reports that an apparent pirate of the radio kind has been heard occasionally using Ishmod's call, if not his name, in Southern California. DFing efforts have always led to Riverside, where hunters always seem to be thwarted by so-called "smart" rock formations.

We continue to seek information about Ishmod and his companions, and would be happy to print any relevant news, comments, or suggestions from readers.

K7GE SK

Jim Larsen K7GE passed away in early February. Jim was the founder of Larsen Antenna, and a ham for some 67 years. A contester, DXer, FOCer, CW enthusiast, experimenter, and mad scientist, Jim loved this hobby and contributed much to it. He will truly be missed by many in the ham community. — W2NSD/1.

AO-10 QSB Alarm

Houston's Jerry Brown K5OE says that there appears to be an alarm of sorts that he has noticed that alerts him when AO-10 is emerging from a deep fade. It manifests itself as a low-volume carrier moving across the passband from high frequency to low frequency at about 1 Hz and about 3 dB above the band noise. Jerry says that all he needs to do is to keep his receiver set to the downlink of 145.904 MHz. He can then go about his other business until he hears the tell-tale carrier as it travels by this frequency. Invariably, the next attempt at an uplink to AO-10 produces a return.

Thanks to Newsline, Bill Pasternak WA6ITF, editor.

Top 10 April Fool's Pranks for the Amateur Radio Operator

- 10. Use a rare DX callsign and turn the power down so you sound like you're really far away.
- 9. Get on the DX reflector and report an opening into your local repeater.
 - 8. Send Morse code backwards, ?LSQ
- Find a guy with a linear and tell him "Your signal is all crackly like your finals are going, old man."
 - 6. Call CQ DX on CB Channel 9.
- 5. Phone your local TV station and tell them you are a ham radio operator in contact with aliens, then patch in the repeater.
- 4. Start at 5 watts, slowly decrease power until the other station can't copy, then kick in the linear and blow his ears off.
- 3. Pretend you are an AM broadcast station and play a bunch of old records in the 20m phone band.
- 2. Pretend your 2m HT is a cell phone and you're trying to call one of those phone-sex numbers, but you're really on the repeater.

And the Number 1 April Fool's Prank for the Amateur Radio Operator:

1. Restructure the hobby.

Thanks to Low Down, official journal of the Colorado QRP Club [cgc@aol.com].

Vast Majority of Hams Not ULS-Ready

Even though registration has been available for approximately two years now, most Amateur Radio licensees have yet to register with the FCC's Universal Licensing System. The ULS Task Force reports that, as of mid-November 1999, 682,212 amateurs still had not registered. This figure includes individuals whose licenses have lapsed but remain in the two-year grace period. The FCC recently said approximately 3% of US licensees had registered with the ULS.

The FCC deployed the ULS for the Amateur Service on August 16, 1999. Amateurs must be registered in the ULS in order to file applications with the FCC — including renewals, modifications, and vanity callsign requests.

The ULS Task Force also wants amateur applicants to know that if they apply too early for license renewal, their applications will be dismissed. A license renewal must be filed no sooner than within 90 days of expiration, even if coupled with a license modification. This is only an issue for those filing paper applications; the electronic filing system will not let applicants file prematurely.

NEDER SRY DIE

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seniors who have trouble sleeping, all-night truckers, and prisoners. Day people have been missing out on some mighty interesting guests.

Terry

I haven't been reading through the longer and longer Silent Key section of *QST*, so I missed the listing of Terry Sterman W9DIA, the guy who started Amateur Electronic Supply. A letter from Ed Moore KK4ZY, now in Kosovo, mentioned that Terry, at 50, had committed suicide in early 1999.

Terry built a huge ham store business, and how he did it is an interesting story. Here's what he told me about it.

His father had a store in Milwaukee selling schlock furniture (cheap and gaudy). Terry, like most of us in those days, when 80% of all new hams were teenagers, got interested in ham radio while in high school. So, instead of spending four years in college, he wanted to start a ham store. His father let him use a section of his store, and explained that if he wanted to have his business grow quickly, he'd have to compete with Allied Radio in Chicago on prices. To get the new business started, Terry sold ham gear at below cost, with his father paying all the invoices for him.

I talked with Terry at the time, and he said his goal was to put Allied Radio out of business. Allied was, I believe, the largest seller of ham equipment in the country at the time. A couple of years later, Allied sold out to Radio Shack. was out of the ham business, and Terry was opening more AES stores.

Around 1971, when the repeater phenomenon was going into high gear, I met Terry at a hamfest. We were both weighing in at around 235 pounds. We were both fat. Well, I decided enough was enough with the fat, so I went on a diet and dropped 85 pounds. When I met Terry a couple years later at a Miami hamfest. I was 160 pounds and he was at around 350.

Terry would call every now and then to buy ads in 73. He'd always start out by telling me how incredibly poorly my magazine was doing for him as compared to the others. Then he'd ask for a big discount in the ad rates to make up for our poor performance. His ploy never

worked. With my other advertisers telling me that they were getting more sales per advertising dollar with 73 than any of the other ham magazines, and by a wide margin, I knew this was just the usual Terry baloney.

Knowing what I do now about what diet can do, not only to the body, but to the mind, I was not surprised when Ed mentioned that Terry was manic-depressive, that he'd been declared legally incompetent, and had lost control of AES. The doctors, of course, gave him medication instead of going after the cause (his diet).

I sure wish that someone had cared enough about Terry to (a) get a copy of my *Secret Guide to Health* to him and (b) convince him to change his lifestyle.

Sure, a lot of hams think Wayne's crazy for believing that I've found the cause of all illnesses, and the way to cure them. The almost universal belief in doctors is so deeply ingrained that it's virtually unshakable, no matter how glaring the evidence. My joy is in getting phone calls and letters from people my book has rescued. Like a call yesterday from a chap who had been dying of emphysema. He could only walk up a few stairs at a time without resting for minutes, and lived most of the time with an oxygen bottle. After a few weeks of my program, he had no more lung problems and was running upstairs.

If only! Sigh. If I'd been able to get Barry Goldwater K7UGA to read my book, I believe he'd be alive today and out there climbing his tower to fix his beam at 90. King Hussein JY1's total belief in doctors killed him. As I say, "Hold the mayo." Ditto Jean Shepherd K2ORS, who was only a little older than I. What a tremendous talent we lost there!

We have all been so solidly brainwashed that when I come along and ask that you at least consider an alternative, and I review a book which will help you get a better perspective, I'm dismissed as crazy.

If you believe in doctors, our public schools, politicians, college, a job, and so on, you are a victim, just like Terry. My Secret Guide to Wisdom will help you educate yourself and blow away much of the brainwashing.

American Know-How

How come the Toyota Camry is the best selling car in America — for the third year running? And second is the Honda Accord? Ford came in third (!) with

their Taurus, and Honda fourth with the Civic? Fifth? The Ford

How come General Motors can't place a car in the top five in sales? Or Chrysler? Are the Japanese better engineers than Americans? Better at production? Better marketers? What's happened to the vaunted American ingenuity?

My wife just bought a Honda Odyssey van. It was the navigator accessory that sold her, I'm sure. Her excuse was that she couldn't drive the Mazda truck I'd gotten last year. It didn't have power steering, it had a manual shift, and the engine tended to stall instead of idle. I bought it used just to use around the farm, and for moving a warehouse full of CDs to our barn. It was fine for what I needed.

So we traded it in on a new Honda van. It has two side doors that slide open and shut at the press of a button on a little remote control. Being a man, naturally I've never had any problem with getting lost, but my wife can get lost driving home from the post office after dark, so the map with a global positioning arrow is great for her.

It's got a great radio, with twelve FM channels and six AM, plus a CD player. It's easy to drive and comfortable. And it has as much room in the back as my truck did!

So, what's the story, Detroit? I started out with a 1940 Ford, which I got right after the war in 1946. Then I inherited my dad's 1941 Ford. That lasted me until I started making some real money. Well, I worked as a radio engineer and TV director, and neither job paid enough so that I could get a new car. It wasn't until I started my own company that I was able to get a 1954 Ford Country Squire. Well, I went wild, of course, with a yacht, a seaplane, and an Arab horse, And that spiffy Country Squire. It was great, with only a couple dozen problems for the car dealer to fix after delivery.

All that changed in 1957, when Ken Grayson W2HDM, my surplus editor, introduced me to sports cars. I opted for a Porsche Speedster, the most exciting and fun car I've ever owned. I put on over 100,000 miles rallying with it, including some SCCA national rallies. I've got a carton of trophies out in the barn somewhere.

A few years ago I wanted to set up a small office in a van so that I could work while I was being driven to give talks to business groups and ham clubs. I settled on a Dodge van. Super bad move. It never did run dependably, despite the best efforts of the local Dodge dealer to fix it. What a turkey! It would run for about a half mile and then stall until I poured a little gas into the carburetor to get it going again.

When Toyota came out with their van I immediately bought one. It was a gem. After five years, I turned it in on a new Toyota Previa van. When the lease ran out on our second Previa, Toyota had discontinued that model and had nothing new that we wanted, so I got the used truck and made do with that.

It was the Honda van with the navigation system that got us back into vans. But it's fun to sit in a restaurant and open and close one of the van's side doors from my table, watching the reaction from the window. How about it, Detroit? What does it take to get through the seemingly brain-dead management?

Ouicksilver

Mercury is one of the most toxic substances known. One drop will send you to the emergency room. A thimbleful will kill you. A half gram in a 10-acre lake warrants a fish advisory. In 1994, Minnesota banned running shoes with lights in their heels because the shoes contained a half gram of mercury.

The average amalgam "silver" filling contains a half gram of mercury. What's dangerous for a small lake is safe in your mouth?

Dentists are placing over 100 million amalgam fillings a year. The American Dental Association says they're safe, despite overwhelming medical evidence to the contrary. Like the tobacco and asbestos industries, they've been denying the dangers. And dentists who have had the courage to prove conclusively that amalgam fillings are causing serious illnesses have had their licenses taken away to shut them up.

The average person with amalgam fillings is breathing up to 29 micrograms of mercury a day. Chewing food, gum, grinding your teeth, and high acid foods can up that to 100 micrograms a day! In 1994, the U.S. Public Health Service said that anything over 0.28 micrograms of mercury vapor per day constituted a health risk from the vapor.

As I've mentioned before, 98% of the people with multiple

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Morse Code — The Once and Future Mode

Will you outlive it — or vice versa?

My grandmother was born in 1877. That means that I personally knew and spoke to a person who remembered the introduction of the electric light, the telephone, the automobile, and world war. She knew her grandmother, who was born in 1840, before the Civil War and before the invention of Morse code and the electric telegraph. I'm 50 years old, and I knew someone who knew someone who remembered the Civil War! The pace of change is so rapid now that we tend to forget that we're only a few generations removed from a very primitive lifestyle.

an has been around for something like 25,000 years (depending on who you talk to, and their definition of man). We have documentary records, i.e., recorded history, going back perhaps 6,000 years, again depending on whom you talk to. But it is only in the last 150 years or so that we have been able to communicate with distant people at speeds faster than a runner,

or a horseback rider, or someone on a boat. One hundred fifty years ago, communications beyond line-of-sight traveled at literally a walking pace.

What we think of as communications today was born with the electric telegraph, which in turn depended on Morse code. What Samuel F.B. Morse and the other pioneers of telegraphy could not know was the profoundness of the changes that would result from

the telegraph. It wasn't just "the birth of communications," but a full-scale revolution in relationships people between who weren't in physical proximity. Warfare, commerce, politics, and everyday life were changed dramatically and permanently.

In 1844, the only telegraph line was Morse's demonstration line between Baltimore

and Washington, a distance of 40 miles. Six years later, according to the U.S. Census of 1850, there were already 12,000 miles of telegraph lines in use. By 1900, there were hundreds of thousands of miles of telegraph lines all over the world, connected in true networks that would be familiar to any student of the Internet.

There were tens of thousands of professional telegraphers. We forget how big a deal it was. And we also forget that the original wet-battery-powered telegraph networks evolved into the elephone system, the wireless radio networks, and even the broadcast media. All of those were gradual evolutions from the original electric telegraph. And at the heart of it all was Morse code.

Just as the original electric telegraph depended on Samuel Morse's code, so did the evolution of radio communications, and later digital communications. It sounds "clever" to say that Morse was the original digital mode, but it's literally true. Morse uses a simple "binary state" to store and carry information, and that is exactly what all those gigabytes of "ones and zeros" on your hard disks and DVDs are using.

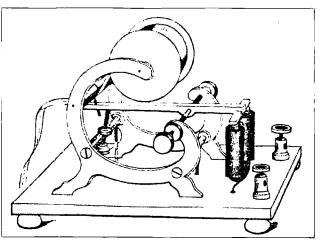


Photo A. 1850s pen register. During a dot or dash, the current through the coils creates a magnetic field that pulls the lever down, pressing a pen against the paper tape.

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What's more, if you want to, you can use any of the current means of communication to carry a message in Morse code. There is actually a large group of former (and aging) telegraphers who use the telephone system to hook up keys and sounders, keeping the art alive with the aid of Ma Bell. I believe they are working on ways to do it via the Internet even now.

Amateur radio operators were the pioneers of wireless telegraphy, and up to a point were the pioneers of most other forms of wireless communication. It is certainly true that code is no longer the defining element of amateur radio, but it is still useful, and fun, and for many of us the true heartbeat of the hobby.

A quick look at the code

What is Morse code, and how does it work? At its simplest level (and undoubtedly the way Morse intended it). it is just a set of dots and dashes or short tones and long tones used to represent the letters of the alphabet. But when it's working properly, that is, used by people who have "mastered" it, Morse code is a set of sensory cues, or signals, that are recognized instantly by the receiver. It is not a language, and it is nowhere near as difficult to learn as a language.

Human interaction is full of such sensory signals, using auditory, visual, and tactile "codes" that are understood instantly and instinctively. Morse is a little more elaborate, perhaps, in that it uses the sensory cue technique to represent an actual language (English or otherwise), and therefore can be used to communicate an infinite number of "messages." But let's look at some simpler sensory cues, which will give us an idea of why Morse works so well.

- · Auditory cues. You hear a loud whistle, and you immediately know whether it is (a) an attention-getting whistle, such as that used to summon a taxi, or (b) a wolf whistle.
- Visual cues. A smile or a wink can convey volumes of information, none of which requires conscious thought. The same is true of more complex signals used by football and baseball

coaches. The ultimate set of visual cues, and a close parallel to Morse, is sign language.

 Tactile cues. You're about to cross the street with someone, and they suddenly reach out and lightly press their hand on your arm. You don't think, you don't translate, you respond.

Recognition of such signals is a very primitive skill, which we all learn at a very early age. They are easily learned (and used) because in evolutionary terms they predate spoken and written languages. There are still many sounds we make that convey real meaning, but are almost impossible to write in words. We can say "the girl screamed" but we can't get the same message across with "the girl went, 'Aaarrrrrrgggggg.""

So, responding to intelligence embedded in auditory signals is a part of our basic skill set as human beings. and it should be no surprise that humans are for the most part very capable of learning Morse code to a point where it can be used without conscious thought. Perhaps it is just difficult to think about things that don't require thought, but in fact, old Samuel F.B. himself missed the boat. and is given more credit than is really due. Morse did not invent the process of copying code by ear — Nope, he designed the code to be written on paper and read by eye. It was wasn't long, though, before telegraphers realized that they could copy what was sent just by listening to the clicks of the pen register, and then it wasn't long before the pen was abandoned in favor of the sounder.

Morse code works with a very primitive part of our brain, and the result is that the technology used to support communication in Morse can be very, very simple. As simple as a flashing light, or a barely audible tone.

The superiority of CW as a mode for amateur radio communications

CW is the mode of communications most commonly used with Morse code. It may be unfashionable, but I think it is important to distinguish between the two. CW is a mode, and Morse is a code. Morse code can be



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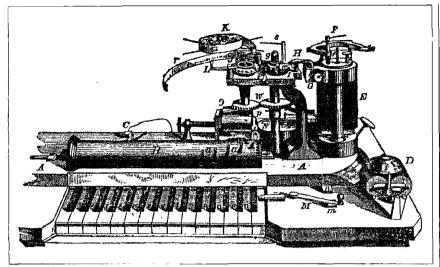


Photo B. 1860s printing telegraph. The "piano keys" are linked to the characters of the alphabet.

used with flashlights, buzzers, sounders, and even FM radio, but none of those is CW. If we don't make the distinction, we can end up with newcomers making horrendous mistakes like "CW practice" using oscillators and FM transceivers in the CW part of the 2m band. Don't laugh — I've seen it done.

But I digress. We were talking about why CW is a superior mode. Just for the fun of it, let's imagine that the hobby of amateur radio doesn't exist, but the FCC has decided that it should be created as a hobby for ordinary citizens. We've been appointed to a committee to consider the options and recommend the best solution.

We start by defining our goal, which is simply to provide a means whereby

two people (to be known as "hams") can communicate with each other over some considerable distance using radio waves. The two people may not know each other, and they may be on opposite sides of the globe.

Having defined our goal, we issue a "Request for Proposals" to interested corporations and groups in the "industry." Because it is a hobby, there isn't likely to be a lot of money to be made by the respondents, so we only get two proposals. Proposal Number One is from a giant corporation called Minisoft, and is titled "SSB 95/98/2000." Proposal Number Two is from the Earth Friendly QRP Club, and is titled simply "CW."

In responsible bureaucratic fashion, we list the advantages, disadvantages,

and costs of each proposal side-byside so that we can make a fair comparison. It's an interesting exercise, because almost all of the pluses are on the CW side of the page. We end up with about 300 pages of overheads, charts, and calculations, and so we try to boil it down to an "Executive Summary" that even our bosses will be able to understand ...

Executive Summary: The "CW" system is superior for amateur radio because the equipment is inexpensive and can be easily built by most prospective hams, a signal requires only a "point" frequency or very narrow bandwidth, and a comparable signal using the "SSB" system will require 18 dB more power output.

The only argument against the CW proposal is that to use the "CW" system, the "hams" would have to learn Morse code, while the "SSB" system requires only that the "hams" be capable of picking up a microphone and knowing when to push the button.

It is the conclusion of this committee that the "CW" system will empower far more "hams," at far lower cost, and with much more efficient usage of limited RF spectrum. But we're gonna recommend the "SSB" system because the Minisoft folks took us out to lunch and gave us a coffee mug.

Attempts to kill the code

Despite the usefulness of Morse code and CW, there have been two major thrusts to eliminate them in the "real world." The first is the abandonment of Morse for communications at sea. We should be able to surmise something about this from the fact that it was done by ukase. What happened was that a (or perhaps the) international maritime organization issued an edict that ships over 300 tonnes were not to carry Morse equipment, period. Those that had it were specifically directed to remove it.

That doesn't make much sense until you consider it in terms of money and politics. Mostly money, of course. I have heard from several maritime radio officers that the ship owners deeply resented having to pay a radio officer "just in case," when any other officer can pick

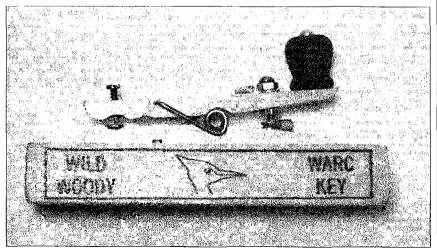


Photo C. A fully functional telegraph key made from a clothes pin by K4TWJ.

can pick up a microphone and use a keyboard to communicate via satellite. How many lifeboats were on the Titanic?

Then there's the military, and guess what? We find money and politics at the root of it again. The U.S. military in particular has a preference for solving problems by throwing technology rather than manpower at them. And, of course, the military's preference is deliberately nurtured by the contractors, many of whom can only survive by selling new technology to the military.

The military being what it is, they take a heavy hand to things at times, and a side effect of all the new communications technology is that MARS stations were ordered not to use CW. Remember, these are essentially amateur radio stations cohabiting in military networks. They weren't given "newer and better" equipment, but ordered to throw away an existing capability!

In our "unreal world" of amateur radio, we have seen a lot of pressure to abandon the code as a licensing requirement. Usually it's sugar-coated, along the lines of, "Nobody is saying you can't use it, we're just saying you don't have to learn it." Why?

It doesn't take much analysis to come up with the answer: money and politics. For most of us as individuals, amateur radio is a hobby. But for far too many "support types," it is an industry. Manufacturers and bureaucracies are concerned that the market is "shrinking." They point to license numbers and say that the amateur population is declining, and getting older, and something must be done. Obviously, we need to make it easier to become a ham, and about all we can do apart from giving away licenses is to eliminate the code requirement.

But guess what, boys and girls. ... We've been there and done that. We got a huge influx of no-code licensees in the '70s, but we didn't maintain their interest, and they are dropping out of the hobby like flies. That is the shrinkage that the industry is seeing. The popular wisdom now is that access to HF will bring them back and keep them in.

The important thing here is that in the three major areas of code use, it is being actively discouraged for reasons which have absolutely nothing to do with its usefulness.

Code today and tomorrow

This article wasn't intended as a defense of Morse code, which, after all is said and done, needs no defense. So let's get down to brass tacks. Literally. Take two brass tacks. Stick them into the end of a clothes pin, facing each other, so that you can click them together. Click them together in the familiar rhythm of Morse code, and

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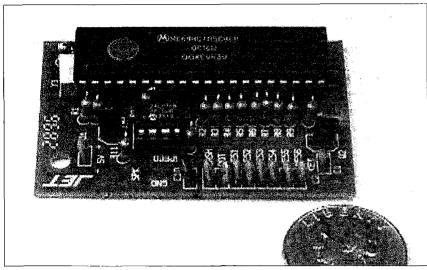


Photo D. Modern "single chip" electronic memory keyer, with microprocessor control.

someone on the other side of the room will be able to hear them and understand what you are saving.

Connect a wire to each of the tacks, and the other end of the two wires to a CW transmitter. Connect another, longer piece of wire to the transmitter, and now someone on the other side of the world can hear your little brass tacks clicking together and understand what you are saying — even if they don't speak English.

The CW transmitter is in essence so simple, so foolproof, that any amateur radio operator can build one, with parts from an old TV set or an inexpensive kit. Before you know it, you

are having fun, and that's what hobbies are all about. Not only is it fun, but you can feel very proud of yourself because you are using equipment that you made yourself!

The range of equipment available for CW operation is huge, as you might expect after a hundred years or more of development. The simple Morse telegraph key is little different from the very earliest examples. But it is a tool, and as with all tools, there have been lots of refinements and artistic renderings.

Many telegraph keys are genuine works of art, including some made from or plated with silver, gold, and platinum, or even studded with jewels.

Photo E. Modern high-speed dual paddle, by G4ZPY. The design is optimized for operation at up to 60 wpm.

As an indication of how pervasive Morse code and the telegraph culture were 70 years ago, the humble telegraph key was used as a motif for all sorts of other items, such as cigarette lighters, staplers, toys, and jewelry (even today, there is a variety of jewelry chain, with mixed short and long links, called a Morse code chain"). Over 50 different manufacturers of "toy telegraph sets" are known, and these sets actually worked.

The basic telegraph key is a simple switch, and there have been many different approaches to the same task from semi- or fully automatic mechanical keys (bugs), to electronic keyers and paddles. The current generation of electronic keyers is based on microprocessors that have more grunt than a mainframe computer did a scant 50 years ago.

I have the extremes pretty well covered in my shack. Most of the time, I use a very advanced memory keyer, with more features than I will ever use, driven by a fairly expensive paddle. But about a foot away from it, and connected, ready for use, is a simple straight key that I bought at a swap fest about a month before I got my first amateur radio license. I still use it from time to time, and not just on Straight Key Night. It's easier and more efficient to use the paddle and keyer, but the minute my hand touches the straight key, I am making a physical and metaphysical connection with my own past and with every telegrapher who ever went to sea, or pulled a Western Union shift, or sent a report from behind enemy lines.

On learning the code

Using Morse code is a *skill*, like riding a bicycle, or playing golf. You have to learn how to do it, and you get better at doing it through practice. Riding a bicycle is a good analogy, because it seems impossible at first but eventually something "clicks" and you can do it. Not only can you do it, you wonder what all the fuss was about. In one respect, however, playing golf is a better analogy because it is *open ended*.

Listings are free of charge as space permits. Please send us your Calendar Event two months in advance of the issue you want it to appear in. For example, if you want it to appear in the July issue, we should receive it by April 30. Provide a clear, concise summary of the essential details about your Calendar Event.

APRIL 1

WATERFORD, CT The Radio Amateur Society of Norwich will hold their Ham Radio Auction at the Waterford Senior Center on Rt. 85. From Hartford, take Rt. 2 South to Rt. 11 to Rt. 85 South. From the shoreline, take Rt. 95 to Rt. 85 North. Talk-in on 146.730(-). Bring your gear to sell (10% commission to RASON). Free admission, free parking. Contact Tony AA1JN at (860) 859-0162, or see the RASON Web page at [www.rason.org].

WEST ORANGE, NJ A Hamfest will be held Saturday, April 1st, 8:30 a.m.-1 p.m.. sponsored by the Roseland Radio Club. For a good time, drive on over to West Orange High School, 600 Pleasant Valley Way in West Orange (Exit 7 off of Interstate Rt. 280), Talkin on the W2QR rptr. system at 146,415(+) 85.4T; 224.480(-1.6); 447.875(-5.0) 156.7T; or 146,520 simplex. Contact Jim Howe N2TDI. (973) 402-6066 or Liz Howe N2WGH. (973) 402-6066. This event will appeal to amateur radio ops, computerists, SWLers, and electronic hobbyists. Plenty of free parking with ground level access. All indoors. Commercial vendors. VE exams by courtesy of Nutley ARC. Admission \$5, at the door only. XYLs and children under 12 admitted free with regular admission. Tables \$12 for the first and \$9 for each additional or \$15.00 for first and \$12 each additional, at the door. \$2 extra for electricity, reserve by March 15. Sellers admitted at 7 a.m. There is a special parking lot for vendors.

APRIL 9

HAMILTON TWP, NJ The Hamcomp 2000 Hamfest will be sponsored by the Delaware Valley Radio Assn., at Tall Cedars of Lebanon Picnic Grove on Sawmill Rd., in Hamilton Twp. I-95 North to I-295 South, Exit 60A to I-195 East; Exit 2 to Yardville; South Broad St. to end, approx. 3.7 miles; left at Yield onto Old York Rd.; next right onto Sawmill Rd.; the site is 1.1 miles on the right. Open to buyers at 8 a.m.; open to sellers at 6:30 a.m. Admission \$6; nonham spouses and children admitted free. Free parking. Tailgating space \$10, includes one admission. Covered table space \$15; includes one table and one admission. Advance covered space reservations are available. Some electricity. Talk-in on 146.67(-), Contact Hamcomp 2000, DVRA, P.O. Box 7024, West Trenton NJ 08628; or call (609) 882-2240. Visit the club Web page at [www.slac.com/w2zq].

RALEIGH, NC The Raleigh ARS will present its 28th Hamfest, NCS ARRL Convention, and Computer Fair in the Jim Graham Bldg., NCS Fairgrounds, Sun. April 9th, 8 a.m.–4 p.m. Wheelchair access. Advance tickets \$5, \$6 at the door. All activities will be inside. Tables and booths are available. Free parking. RVs welcome. A hospitality party will be held Sat. night. VE exams W4VFJ, (919) 556-8551. Dealers, contact Greg Miller W4IK, 9408 Hinshaw Rd., Wake Forest NC 27587; tel. (919) 528-6510. Talk-in on 146.64/.04.

APRIL 14-15

BLAINE, MN The 19th annual Midwinter Madness Hobby Electronics Show will be held at the National Sports Center, north of Minneapolis/St. Paul on 35W, Exit 32. The Robbinsdale ARC is celebrating its 42nd year! VE exams Fri., April 14th. Exposition April 15th 7:30 a.m.–2:30 p.m. Super buys on computers, hardware, components, peripherals, and amateur radio equipment. Admission \$7 at the door. Contact RARC, 4737 S. Hwy. 101, PMB #276, Minnetonka MN 55345; or call (612) 537-1722. Internet [http://www.visi.com/~kØltc]. E-mail [kØltc@visi.com].

APRIL 14-16

VISALIA, CA For over 50 years, the Southern and Northern California DX Clubs have alternately sponsored the annual International DX Convention in Visalia CA. The Year 2000 Convention will be sponsored by the Southern California DX Club (SCDXC), on April 14th, 15th, and 16th, For additional info check the Web site at [http://www.scdxc.org/dxconv 2000.html]. The pre-registration deadline is March 15th. \$60 before the deadline, \$65 after. Contact Don Bostrom at (818) 784-2590 for more info. Your reservation fee includes the following: A hosted cocktail party; all HF, Lowband and DX-oriented forums and technical sessions; the Traditional Conventions Patch: the Saturday Night Banquet and DX oriented programs, featuring a well-known speaker; and the Sunday morning breakfast buffet with wellknown quest speakers. For hotel info call 1-800-524-0303 or the Internet at [www.cvbvisalia. com1.

APRIL 16

SHAKOPEE, MN Smartsfest 2000 will be held April 16th, 12 noon–5 p.m., at Canterbury Park in Shakopee. Vendor setup starts at 8 a.m. VE

exams start at 10 a.m. Remember to bring your CSCEs for your new upgrade. Flea market tables \$10. Admission \$4 in advance, \$5 at the door. Talk-in on 147.165(+). For more info write to SMARTS, PO Box 144, Chaska MN 55318.

APRIL 29

SONOMA, CA The Valley of the Moon ARC. W6AJF, will hold its annual ARRL Hamfest Sat., April 29th, 8 a.m.-Noon at the Sonoma Valley Veteran's Memorial Bldg., 126 First Street West, Sonoma, Admission is free. Registration starts at 9 a.m. for a walk-in VE exam session. Testing for all license elements begins at 10 a.m. There will be an electronics swap meet with both indoor and outdoor spaces available. Setup will start at 7 a.m. Spaces \$10 each. The club will serve a full breakfast 8 a.m.-10 a.m., including eggs. pancakes, sausage, juice and coffee or tea for \$5. A pancake-only breakfast will be \$3.50. Forums will include an operating QRP station. display of homebuilt equipment, and a beginner's RDF hunt. VOMARC will participate in the QRP To The Field contest which will run during the hamfest. Guest operators are cordially invited to sit in and take a turn operating the club station. For a map and printed directions to the hamfest, send a business size SASE to VOMARC, 358 Patter St., Sonoma CA 95476. Talk-in will be on 145.35(-600), with a PL of 88.5. For more info call Darrel WD6BOR at (707) 996-4494.

STICKNEY, IL DuPage ARC's Hamfest and Computer Show will be held 8 a.m.-2 p.m. April 29th, at the Hawthorne Race Course, 3500 South Cicero Ave., Stickney IL. Tickets are \$5 in advance and \$6 at the door. Send a check payable to DARC and enclose a #10 SASE. Mail it to DARC Hamfest '00, 7511 Walnut Ave., Woodridge IL 60517-2818; (must be received by March 30th). Children under 12 years old admitted free. Commercial dealers can set up indoors Fri., 3 p.m.-6 p.m. Commercial and flea market vendors can set up on Sat. after 6 a.m. VE exams, all classes, 9 a.m.-Noon. Walk-ins welcome. Free parking. For table availability and more info call (630) 985-9256. Talk-in on 145.25. No overnight parking or camping. Email [DARChamfest@aol.com]. The Web site is [WWW.W9DUP.ORG].

APRIL 30

ARTHUR, IL The Moultrie AR Klub will hold their 38th Annual Hamfest, 8 a.m.-1 p.m., at the Moultrie/Douglas County Fair Grounds on

the south side of Arthur IL. Talk-in will be on 146.055/.655 and 449.275/444.275. Admission is \$5 per person over the age of 14 years. Tables \$10 each, paid in advance. For info or table reservations, write to M.A.R.K. P.O. Box 91, Lovington IL 61937. Or call (217) 543-2178 days; (217) 873-5287 nights.

MAY 6

CEDARBURG, WI The Ozaukee Radio Club will sponsor its 22nd Annual Cedarburg Swapfest, 8 a.m.-1 p.m. at the Circle-B Rec. Center, Highway 60 and County I (located 20 miles north of Milwaukee, west of Grafton). Admission \$4, both in advance and at the door. 4-ft. tables are \$5 (limited power on request). Seller's setup at 6:30 a.m. VE exams start at 9 a.m. Talk-in on 146.37/.97 and 146.52. For tickets, table reservations, maps or more info, send an SASE to Joe Holly, ORC Swapfest Chairman, 1702 Holly Lane, Grafton WI 53024. Tel. (262) 377-2137.

SILOAM SPRINGS, AR The Siloam Springs ARC Hamfest and Flea Market will take place at St. Mary's Catholic Church at 1996 Hwy. 412 East in Siloam Springs AR. Hours are 8 a.m.-3 p.m. Talk-in on 146.67. Computer seminars will be held during the hamfest. Contact Matt Hyde N5UYK at (501) 524-4797.

OWEGO, NY The Binghamton ARA will host the 2000 Owego Hamfest, May 6th, starting at 8 a.m., at Tioga County's Marvin Park Fairgrounds. Setup for vendors and tailgaters at 6 a.m. Indoor vendors who require Friday setup, call ahead of time. Admission \$5. Tailgate spots \$2. Indoor tables \$10 ea. VE exams will be conducted in a quiet setting at the school next door. For more info, or to reserve an inside table, E-mail [rmess@ binghamton.edu]; or call Bill Coleman N2BC, (607) 748-5232; or write to BARA, P.O. Box 853, Binghamton NY 13902-0853.

MAY 6-7

ABILENE, TX The Key City ARC will sponsor their 15th annual Hamfest at the Abilene Civic Center from 8 a.m.-5 p.m. Sat., May 6th, and from 9 a.m.-2 p.m. Sun., May 7th. Free parking. VE exams. Wheelchair access. Limited RV parking for a nominal fee. Tables \$6 each. Preregistration \$7 (must be received by May 1st), \$8 at the door. Talk-in on 146.160/.760. For reservations and info contact Peg Richard KA4UPA, 1442 Lakeside Dr., Abilene TX 79602; tel. (915) 672-8889. E-mail [ka4upa@ arri.net1.

MAY 7

HAGERSTOWN, MD The Antietam Radio Assn., Inc.'s 8th Annual Great Hagerstown Hamfest & Computer Show "The Millennium Hamfest" will be held at Hagerstown Community College Rec. Center. From Interstate 70, take Exit 32B to Edgewood Dr.

(Home Federal bank on right). Turn right, Drive 1.4 miles. Entrance to the college is on the left. Follow signs. From the north or south, take Interstate 81 to Interstate 70 East. Follow directions as above. Talk-in on 146.94 and 147.09 rptrs (W3CWC). Gates open at 6 a.m., building opens at 8 a.m. General admission \$5, children 12 and under free. Tailgating is an additional \$5 per space on an asphalt tailgate area. New and used computers and supplies, and ham radios will be the featured items. VE exams by the ARRL VEC Team, on the 2nd floor of the Rec. Center. Walk-ins OK at 8:30 a.m. For more info contact Greg Lanham WA4VE. (540) 772-4792. E-mail [kuan@ visuallink.com]. There will be an ARRL forum at 10 a.m., and an ATV forum at 11 a.m.

SPECIAL EVENTS, ETC.

APRIL 8-9

GREEN VALLEY, AZ The Green Valley ARC will conduct their 9th annual commemoration of the closing of all Titan 2 missile sites by operating N7GV from 1800Z April 8th to 2100Z April 9th. Frequencies are: 7.272, 14.272, 21.372 and 28.372. A certificate is available. Send requests to GVARC, 601 N. La Canada, Green Valley AZ 85614.

APRIL 15

AMES, IA The Cyclone ARC of Iowa State University will operate WØYI on April 15th, from 13:00 to 23:00 UTC, in conjunction with Iowa State University's VEISHEA 2000 Celebration. Frequencies will be 7.240, 14.240, 21.325, and 147.375. QSL cards available. Send request to Cyclone ARC, lowa State University, Friley Hall Box 7275, Ames IA 50012.

APRIL 30

STERLING HEIGHTS, MI Special Event Station W8A will be operated by the Utica Shelby Emergency Communications Assn., for the March of Dimes Walk America on April 30th. Operation will be on the General portion of the 20 and 40 meter bands and the Novice/ Tech portion of the 10 meter band. The station will be on the air 1100Z to 1700Z. U.S.E.C.A. will acknowledge contacts with either a postcard QSL or an 8.5- x 11-inch certificate to all verified stations that send an SASE to U.S.E.C.A., P.O. Box 1222, Sterling Heights MI 48311-1222. For more details and updates on this event, visit the Web site [www.useca.org].

MAY 5-7

MARTHA'S VINEYARD ISLAND, MA The Fall River ARC will operate W1ACT portable from the Gay Head Lighthouse on Martha's Vineyard (IOTA NA-046). Frequencies: 14.260, 21.260, 28.460 and 146.55 MHz. Operation will start May 5th at 18:00 UTC and end May 7th at 21:00 UTC, Please QSL SASE via N1JOY.



Arthur R. Lee WF6P 106 Western Ct. Santa Cruz CA 95060 [codelee@aol.com]

The Long-Lost Art of Conversational CW

Banging away for long chats can be fun — if you know what to say.

Probably one of the best and most interesting parts of the ham radio hobby is meeting and making new friends over the air. Yes, with the advent of E-mail, this can be done with the aid of a computer and modem. However, typing out messages on a computer keyboard doesn't have the "feel" of live, on-line communications.

Besides, with ham radio we are talking to fellow hams. These are hams who have gone through the learning and licensing

Photo A. Marsha Messer AB7RJ, of Yacolt WA, works Morse code from her home station.

process we all had to pass through. This unique "trial by fire" gives us a common bonding, one where we can relate to each other from the very first "Hello, my name is...."

As Novices, we were taught to begin our QSOs with the old tried-and-true format. We would give our callsign, RST, the all-important QTH, the description and power output of our rig, antenna type and height, and our name. The all-too-common ending with a "Thanks for the contact, see you down the log," always seemed like a waste. Sure, a logbook entry was made and perhaps qualifications for an award were met, but to me, an opportunity was lost to make a friend. Well, maybe we weren't going to make a friend every time, but it was a missed chance to exchange some pleasantries or learn something about the other hams we meet on the air.

To me, everyone is interesting. They all have life stories, and most are willing to share bits and pieces of them with us. In keeping with the Novice format, there were other topic expansions such as, "I have been a ham since" Also, another good lead in was the old "My occupation is" With these openers, a QSO can be turned

into an interesting learning experience. Having served in the U.S. Navy for many years, I find that contacts with former service members leads to some interesting "sea stories." The old "Where were you during such and such a time period?" leads to some "It's a small world" exchanges.

Ask questions

Once you've made a contact with someone who seems willing to linger longer than an exchange of data, try to hang on a few minutes with some follow-up questions. I usually make a note or two as the QSO progresses. I leave a wide margin on the right-hand side of the note paper I use to copy my CW. If their QTH is interesting or near a place I would like to know something about, I ask for details. If their occupation interests me, I ask about that. I usually ask about their hobbies — other than ham radio. Children? Grandchildren? Most of us like to talk about our kids and their successes. Once you get the ball rolling, the rest is easy.

QSO in progress

Once off to a good start, your QSO will keep you going with the new

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information gained from the answers to your questions. Just this moment I heard a station in Colorado breaking into a net asking for a signal check on a new amplifier he had restored. While I wrote, I overheard him mention that he had operated maritime mobile for many years. I quickly broke in and asked him what his experiences were in maritime mobile, one of my favorite topics. He came back with some great stories about sailing in the Atlantic aboard a small sailboat (his idea of small was 50 feet!). While the contact was brief and on SSB, I use this as an example of grabbing onto an interesting topic and exploring it. Granted, on CW this "exploring" takes a bit longer than on voice, but the principle is the same. Anything that arouses the interest of either party is grist for the CW mill. Once a common topic of interest is reached, jump right on it with gusto.

Making good friends

Years ago, when I was a Novice, I resolved to work stations "far away." I operated on the 40 meter band at all hours of the day and night, copying weak signals. One night at about 2200, I picked up a station that was almost inaudible. A ham in a remote corner of northwest Arkansas was banging out a steady "CQ." At my then-speed of about 5 words per minute, I responded. His code was perfectly readable, slow but methodical, and without errors. Hmm ... this could be fun. And it was. The fellow on the receiving end of my RF was a former Army radioman who had retired to the center of the United States to relax, fish, and enjoy what beauty nature had to offer. Knowing little about his state, I plied him with questions. He replied with some historical data. He was from Caddo Gap, not far from where early French explorers had traveled. I was getting a history and geography lesson at the same time!

He was a Novice like me, but when he mentioned that he knew some of the older movie stars of the '30s and '40s I was fascinated. Yes, he had swum in the ocean with Ozzie and Harriet Nelson when they were working

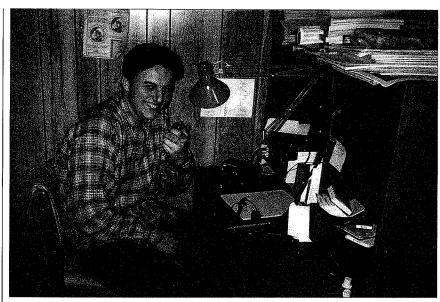


Photo B. Brad Messer KC7KTL shares the same rig.

together in music. We talked of the other Hollywood personalities he had worked and played with.

His code speed kept pace with mine. First at 5 wpm, then 8, then 10. I marveled at the overall progress we were making in our code speed. One night just before our schedule. I heard code at about 30 wpm. Then there was a break for a callsign. It was my friend, conversing with other CW pals! I thought he was working at his max speed with me! Not so. He was merely helping me along. The operator was Rod Lowe KA5NIM, and we became lifelong friends. When my wife (Donna AB6XJ) and I traveled crosscountry with our trailer, we purposefully detoured a few miles to "stop by for a cup of coffee" with Rod. We worked CW every night until we arrived and parked in his front yard. He and his wife had dinner on the table for us when we got there. They wouldn't let us leave until three days and nights had passed.

Another good friendship I've made, with the Messer family in Washington state, was documented in these pages in the January 1998 issue ("Marsha and Me: Making friends via hamming.").

CW contacts fun? You bet!

Most hams have led interesting lives. Even an eight-year-old ham can be interesting. How did they get to be hams? Where do they live? What influence has their parents played in their lives? Once you get them to talking about the life experiences they have had, QSOs get interesting. In Marsha Messer's words, "Most new hams are nervous when using code. I understand that. When I first started out with CW, I was still trying to form words into sentences, and I had to work hard at it. Now, it's easy. I know that lurking inside every new or nervous ham is a rag-chewer just waiting to be let out of the box to have fun. It may just take a little time and urging from us until another full-blown rag-chewer is born."

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Morse code is fun. It is a universal language based on a combination of short and long sounds or blinking lights. It can be learned, mostly with practice, in a short time.

orse code goes back over 150 years, when it was invented by Samuel F.B. Morse 1791–1872. He sent the message "What hath God wrought?" over the first telegraph line from Baltimore MD to Washington DC. His "language" gained worldwide acceptance. Even though more sophisticated modes of communication exist today, thousands of amateur radio enthusiasts ("hams") use the code with simple radio equipment and antennas to communicate across the state and across the globe.

One fun way to learn the code is for

two friends to take turns sending the code back and forth to each other. A simple buzzer can be easily constructed with readily available parts for a few dollars (see photo and drawing). The buzzer (No. 273-065) and a 9 volt battery can be purchased at Radio shack. If you do not have a key, or know someone who can lend you one, a simple one can be made. As you can see in the photo, you will need three pieces of aluminum or tin. Just be careful not to cut yourself on the sharp edges. The knob can be half of a sewing thread spool, which can be fastened to the metal arm with a nut and bolt.

Everything will fit on a piece of scrap wood about 8 by 10 inches. Just about any kind of wire, like bell wire, can be used to connect the parts together. Make sure you scrape the insulation off the wire where it connects to the screws or the buzzer. When finished, you have a complete circuit. By moving the key up and down, you open and close the circuit and make the buzzer buzz.

Dits are very short, and a dash is three times as long as a dit. Don't try to count the dits and dashes as they are

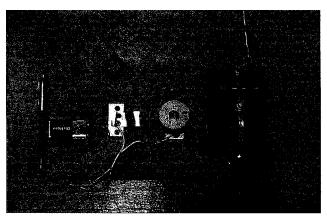


Photo A. Your code buzzer is all finished and ready for fun.

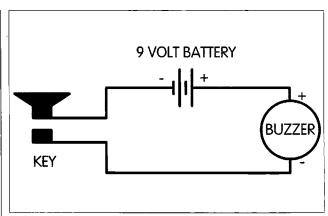


Fig. 1. Wiring diagram for the Morse code buzzer.



More on Embedded TICKs

Here's an update on those tiny CMOS keyers.

What's very small $(1" \times 1")$, inexpensive, easy to build, and can be used as a code practice oscillator or a Morse keyer? The answer is the TICK series of tiny CMOS keyers from Embedded Research.

The kit I built is called the TICK-1. ■ The 8-pin CMOS chip that controls this keyer sells for \$5, and the complete kit is \$16. I built the kit. The kit comes with the board and all boardmounted components, as well as the two jacks for the paddles and rig connect, and the push-button for keyer control. This keyer chip is one of a series of five available keyer chips or kits from Embedded Research (PO Box 92492, Rochester NY 14692; E-mail: [embres @vivanet.com]; site: [www.vivanet. com/~emres1).

I started in ham radio not all that long ago, or so it seems. I have always enjoyed CW operation. My first keyer kits cost me in the neighborhood of \$50. The keyer did not have many features and was fairly large. Newer technology is always getting smaller and cheaper, which means we get to play more for less money. This keyer board is small enough to put into many interesting keyer/paddle/rig combinations. I have put the keyer into a computer mouse. I was able to lit the keyer and a battery in the mouse-paddle. I ended

up with a small and rugged and very inexpensive paddle/keyer arrangement. I have also managed to build a complete dual paddle arrangement in a small Altoids box. The paddles work very well; I have taken the setup on many portable operations and made numerous contacts with it.

The TICK-1 kit took me about 30 minutes of slow and easy building. The TICK-1 includes iambic Mode A/B. speed adjust, a tune mode, a selection to allow which paddle is dit or dash. and a manual key mode. There were a

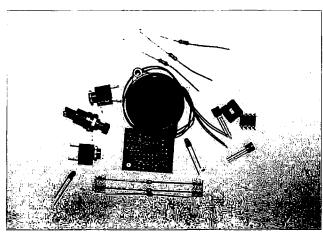


Photo A. Unassembled TICK kit.

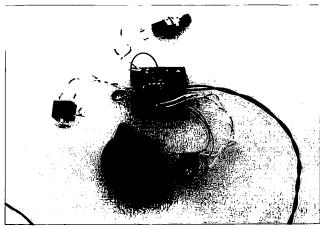


Photo B. TICK kit put together.



Photos C. TICK in your can.

total of seven board-mounted parts in the configuration I built. Aside from the simple board arrangement, you wire up the paddle jack, the keyline to your rig, and the push-button.

During the building process, you get to choose whether you want to build the kit to run on a regulated 3-5 volt source or a 12 volt source. I chose the 12 volt source because of the supply I use for testing kits, which sits right next to my workbench. The parts are included for either arrangement.

The next choice is what you would prefer to use for audio feedback/ sidetone. I chose to use the piezo method. This is the simplest way, and a nice piezo speaker is included with the kit. You can use this as a nice code practice oscillator in this configuration.

Due to the simplicity of the kit, there are not many building steps. The directions are straightforward and very easy to follow. I did lind a minor error that did not cause me any problems. In step 8 of the directions, it refers to the keyline jack as J2. and the picture under the step labels it as J2. In the parts

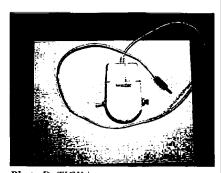


Photo D. TICK in your mouse.22 73 Amateur Radio Today • April 2000

Action	TICK Response (in Morse code)	Function
Press button	S	Speed adjust: press dit to decrease, dah to increase.
Hold button down	Т	Tune: puts rig in transmit, press either paddle or push-button to unkey.
Hold button down	Р	Paddle: press paddle that you want to be dit.
Hold button down	Α	Audio: press dit to enable sidetone, dah to disable. Default enabled.
Hold button down	SK	Straight key: pressing either paddle toggles between straight key/keyer. Default keyer.
Hold button down	М	Mode: pressing the DIT paddle for iambic A, dah for iambic mode B (default).
Hold button down K		Keyer: if push-button is released, keyer returns to normal operation.

Table 1. This table explains the TICK-1 functions.

list, on the circuit board, and in step 8d, the part is referred J3. The jack is also listed as J3 in the parts list. J2 is labeled on the circuit board as the 12 V input.

I would suggest using a low power, fine-tipped soldering iron. I used my

old, faithful, cheap Radio Shack iron. I have been hinting to the family for a couple of years about a soldering station, but they are always looking for

Model	Features
TICK-1 (Chip \$5, Kit \$16)	lambic mode A/B, speed adjust, tune, sidetone, paddle select, manual key
TICK-2 (Chip \$10, Kit \$21)	All TICK-1 plus 25-character memory
TICK-2B (Chip \$12.50, Kit \$23)	All TICK-2 plus beacon mode and easier memory playback
TICK-3 (Super TICK) (Chip \$15, Kit \$25)	All TICK-2B plus two 50-character message memories
TICK-4 (Chip \$15, Kit \$25) (Enclosure \$15)	All TICK-3 plus nonvolatile operating parameter storage (mode, speed, sidetone, keyer/beacon/straight key mode)

Table 2. Summary of features.

The Finger

Here's a positive way to respond when someone gives it to you.

I was reading the mail on the 2-meter repeater, half-asleep at the operating table of my basement shack Saturday night, when I heard the doorbell chime upstairs. Moments later, the three officers of the Hunky Hollow Work 'Em All DX & BS Society came trooping down the steps, presumably sent by Stella, my XYL. A problem was about to be solved.

swung around in my swivel chair to greet them. They all looked sour. I scanned my memory bank, wondering if I'd done something to offend them, like working a rare one without alerting them to share it. Nothing came to mind.

"Hi, Guys," I said, not getting up. I cut the audio from the 2-meter set. "Sit you down." They did, all three parking on the sofa against the wall, Solly on my left, Cholly in the middle, Wib on my right. "Take your wraps off and tell me what's happening."

Nobody moved to shed coats or hats. They just sat there, silent, staring at me as though I were the bad banker who'd repossessed their rigs.

"Okay," I said, after a while. "Let's have it."

Cholly nodded. "We got trouble, Duke, and you gotta do somethin'." "Whoa," I said, managing my friendliest smile. "You guys run the club. You're the president, Cholly. Whatever the trouble, YOU solve it."

All three started their heads shaking in unison from side to side and kept them waggling like a row of those spring-necked doggies you see in car windows. Wib spoke up. "Nuh-unh. We already voted before we came over. He's your friend and it's your rig, so you gotta do it."

"Aha," I said, putting the blocks together. "Are we talking about Uncle Elmer?"

"You can't get on without he's layin' there waitin' for you," Cholly said.

"Right,". Wib chimed in. "You can listen around for hours without tipping your hand, and the minute you QRL or CQ, or call anybody, he's on you, covering any other signals, sending almost unreadable CW at maybe five words a minute, and long-winded."

"Poor old guy's got a problem with arthritis," I explained. "His hands are so gnarled up he can't handle the Vibroplex anymore. All he can do is punch at a straight key with one finger."

"So why's he bother?" Solly demanded. "Whyn't he just listen around and read the mail and quit tryna work guys when he can't cut it no more?"

"Whoa up, you birds," I said, feeling my blood pressure soar. "Remember who you're talking about. This man's been rag-chewing on forty meters since before you were born. He taught me what I know and he brought maybe half the other locals into ham radio. Why do you think we call him Uncle Elmer? He's a little older now, but he's still sharp mentally, he still loves hamming, he's got nothing else to do, and if anybody deserves a bit of care and feeding in his declining years, he does."

"You been on lately?" Cholly demanded. "You had him grab you and won't leggo?"

"No," I admitted. "I haven't had much operating time the last month or so. We're breaking in a new publisher at the newspaper and you know how it is when your work gets ..."

"Fire up the rig," Solly interrupted. "Now. Anywheres on the low end of forty. Anywheres."

I shrugged, mystified. "Okay." I swung my swivel chair around, flipped the main switch, eyed the readout on the HF transceiver. "Seven-oh-four-oh okay?"

"Good as any." Cholly said.

The three men got off the sofa, still wearing their hats and coats. and walked over to stand behind me. I switched on the HF gear. A little clatter of QRN came from the station speaker.

"Say something," Wib directed.

The Finger

continued from page 23

I fingered the keyer paddle, sent ORL? QRL?, and signed.

Instantly a signal rattled the speaker cone. It was calling me at 10 decibels over S9 at maybe four words a minute and messing up half the characters. It was Uncle Elmer. When he signed, I sent his call, mine, then launched the sometimes phony, sometimes sincere string of comments you use to greet an old and dear friend or a new and unknown contact:

Ge om es tu for the fb call BT am vy psed to cu es so hpy fer the contact BT hpe all wl at ur house BT hr ur fb sig is 599 5nn wid no problems es fb cpy BT hw nw? AR

Signing, I sat back and listened to the pathetic fist of the old man trying to talk to me. My eyes misted over as I visualized Uncle Elmer prodding the ancient hand key with a right index finger, remembering what a consummate op he'd been until arthritis crept down his arms to cripple his hands and then, a year ago, the mini-stroke lamed up his legs. Now it took him five minutes to say, shakily and almost indecipherably:

Hi kid abt time you showed up BT where you been? BT the band ain't what it used to be BT guys dont like to ragchew much any more BT specially not wid a slow es crummy op like me BT can't blame em but nobody to talk to BT lots of contests only all at 40 per so I can't get in BT u okay? BK

I acknowledged with a string of Rs, assured him I was fine, told him that Stella had asked me about him that very morning (she hadn't), made small talk for another few minutes, let him rant on in very low-speed and very-messed-up Morse for another transmission, then said I had to run but would be looking for him again tomorrow.

"Ain't he a pain?" Cholly demanded, when I swung my chair around to face my three visitors standing side by side and ogling me grimly.

"No," I said. "Uncle Elmer is not a pain!" I sighed, hating to admit it. "But working him is pretty painful."

"Ha!" Wib shouted. He took a step toward me, leaned over to shake a finger 24 73 Amateur Radio Today • April 2000

in my face. "You think working him once is painful? Let me tell you painful! Three, four times a day every day is painful. Ever since you gave him your old rig and got him back on the air, it's three, four times a day you have to come back when he hears you on and calls you, snailing along at maybe five words per and covering anybody else who might be calling you and can't read half his copy. THAT's painful!" He stepped back into the line.

My three fellow officers of the Hunky-Hollow Work 'Em All DX & BS Society, still dressed for a winter storm, went to car-window doggying again, this time their heads bobbing up and down in vigorous and simultaneous assent.

I realized I was nodding in reluctant concurrence, even though it was Uncle Elmer we were talking about.

"Guys," I said. "You're absolutely right. But it's shameful. And we have to do something ..."

"Nuh-unh," Cholly interrupted me. The three heads stopped nodding. The three sets of eyes bored into mine. "Not we. You!"

They turned on their respective heels and headed for the stairway up and out.

"Thanks a lot, fellows," I said. They didn't answer.

Sunday afternoon, I found Uncle Elmer in his wheelchair parked in front of the desk bearing the old Kenwood TS-830S I'd set up for him in this second-floor bedroom of his son's house across town from my QTH.

He was scanning the low end of 40 meters when I walked into the room, cranking the tuning knob first clockwise then counterclockwise with the forefinger of his right hand. Green numbers counted up and down on the display as fragmentary signals and an occasional burst of static sounded from the speaker.

"What's happening, Uncle Elmer?" I asked, stepping up behind him and patting his shoulders.

He turned his head, grinned up at me, said, "Oh, hi, Duke. Want some coffee?"

"Not a thing, thanks." I went to the bed along the far wall and sat down on it. "Rig working okay? Signal sounded good last night."

"Sure." Uncle Elmer dropped his eyes from mine. "And that dipole you hung in the trees, too. I get out fine. That's not the problem."

I decided to play dumb. "There's a problem?"

"Of course. The problem is I'm a lid and nobody wants to work a lid."

"You a lid?" I said, contriving to sound incredulous. "The world's best operator? The ham with more trophies and plaques and certificates and awards than Hiram Percy Maxim himself? What are you talking about?"

Uncle Elmer speared my eyes with his. "I'm talking about an eighty-two-year-old ex-op who can't finger a bug or squeeze a paddle or even stroke a hand key anymore. I'm talking about a has-been who wishes the world would talk to him, but realizes its people have other priorities."

I blinked. I said, "That's baloney."

"It's not baloney. I sit up here with nothing to do, trying to wish things back the way they were. Well, life doesn't do reverses for you. That's the way it is. So I don't bother strangers by calling them. I wouldn't expect them to come back to a crippled old fart sending error-filled CW at four words a minute. And my few friends don't need that kind of nuisance, either."

"You're talking nonsense," I said, wanting desperately to reassure him and to convince myself that things were going to be better. I looked at his operating desk for inspiration. I saw none. Beside the Kenwood there was a pad of paper and two wooden pencils, a dime-store pencil sharpener, an ancient Allied Radio logbook, a box of tissues, a coffee cup, and an old brass hand key screwed to the desktop. I said, "I'm ... working on something."

"Like what?" he demanded.

"Like turn off the vox gain so the rig's finals don't key and let me hear your fist."

"It isn't a fist." He tried to smile, didn't quite make it. "What God's given me is the finger." He held up his right hand for my inspection. The forefinger

was sticking out, bent a bit. The other fingers and the thumb curled into a gnarled and twisted fist.

"So finger me a string of Morse with

He turned off the vox gain and began poking the key knob with his fingertip. The rhythm and the timing of the sidetone blips and bleeps from the speaker were terrible. Some of the dots and dashes were too short, some too long. It was not good CW.

After a while he stopped. Banging his twisted hand against the desk top in obvious frustration, he shouted, "I'm a lid, a dang ham-handed, clutter-fisted LID!"

I stood up. I said, "Stop it." I said, "Listen, Uncle Elmer, you guit that kind of thinking. What we have here is a small and temporary problem that we're going to fix." I walked out to head for home.

I was halfway down the stairs when I heard his shouted question. "How are we going to do that?"

I didn't answer, because I didn't know.

It was Saturday night again. I was in the basement shack again, but waiting, not interested in reading the mail. I heard the doorbell chime upstairs and directly the three officers of the Hunky Hollow Work 'Em All DX & BS Society were trooping down the steps again.

This time I stood up to greet them.

"Hi, guys," I said. "Take off your wraps. Solly and Wib, sit you down on the sofa. Cholly, you take the operator's chair. You're going to be working the rig for a little bit. Then we'll have us a beer."

The three, eyeing me suspiciously, peeled off their coats and hats and hung them on the wall hooks where I pointed. Solly and Wib parked obediently on the sofa, still ogling me. Cholly stood alongside the swivel chair, his eyes on my face.

"Thanks for coming," I told them. "Cholly, you've handled my station before. Fire up anywhere on the low end of 40 with a QRL or a QRZ or a TEST or something."

He didn't move. "We expectin' Uncle Elmer?"

I nodded, realized I was grinning, didn't care, "We are,"

"He hasn't been on all week," Cholly said. "We're grateful. We figured you took back your rig."

"I did better than that," I said. "Go on. Fire up."

Cholly sat down in my chair, scooted it up to the operating table, flipped some switches, sent a terse QRL? QRL?, and signed his own call once.

Machine-quality CW came back to him at a stately 15 words per minute. It said, "GE Cholly," and it signed Uncle Elmer's call. A nice little QSO ensued, ended, and Cholly swung around in my swivel chair, his mouth hanging open, his face a question mark. Solly and Wib on the sofa were staring at me

I giggled, said, "How about that?" "That wasn't really Uncle Elmer, right?" Cholly demanded.

"Wrong. That WAS Uncle Elmer. He was using a CW keyboard. I took it to him Monday and made him promise to

practice off-air all week, then listen for one of us tonight."

Cholly gulped. He said, "A keyboard? With one finger?"

"No surprises there, if you think about it," I said. "It dawned on me that I've made a living for forty years punching typewriters and then computers with two fingers and a thumb. And I figured if I can type fifty-sixty words a minute that way, Uncle Elmer surely can go fifteen or so with just the one."

There was silence for a time. Then the station speaker began whispering nicely spaced, perfectly formed CW characters. When the short string of CQs ended with Uncle Elmer's callsign, I held my breath for a

Continued on page 59

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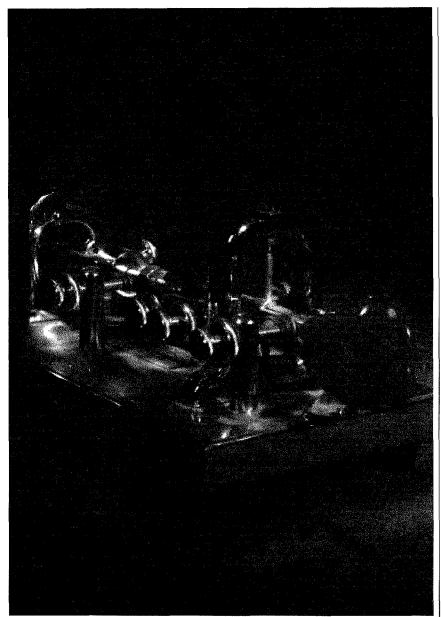


Photo A. Bencher iambic key.

This month's cover shot comes to us courtesy of Bill Everett W700, Everett WA. The iambic hand key (**Photo A**) was made by Bencher, and is used by Bill on the air most of the time.

Photo B shows another part of Bill's collection, a chrome key made in Russia. This is one of only 23 that were imported into the U.S.

The beautiful hand key in **Photo C** was made by Nye Viking as a special run for Icom, whose marketing department presented this to Bill.

Our thanks to Bill W700 for sharing these with us all. — *Ed.*



Photo B. A chrome key made in Russia, one of only 23 such items imported into the U.S.



Photo C. Nye Viking hand key.

NEUER SAY DIE

continued from page 8

sclerosis have tested high on mercury. It's been shown to contribute to chronic fatigue syndrome and Alzheimer's disease.

Amalgam fillings are being prohibited in a growing number of the more enlightened countries in Europe and Scandinavia.

I met dentist Hal Huggins several years ago at a science conference and watched his amazing video. He showed patients arriving crippled up in wheel chairs to have their amalgam fillings removed, and then a few weeks later walking around in good health. The ADA pulled his license.

My Secret Guide to Wisdom reviews both the Huggins book, It's All In Your Head, and Dr. Lydia Bronte's The Mercury In Your Mouth. Lydia wondered why she was so sick, and discovered that if the mercury in her 17 fillings had been put on her livingroom floor, the EPA could have quarantined her apartment.

The Euro

The new international currency, the Euro,

has been a flop. It started out at over \$1.16 to the dollar, and now it's down to a dollar even. How come? Simple.

Any new product has to be a whole lot better than the established product for people to adopt it. In this case, the American dollar has been way out in front as the main international currency for decades. Ninety percent of all of the world's international bank transfers are done in dollars. Thus, the change to the Euro would have been an expensive one, with little in the way of benefits.

Then there's the lousy financial situation most European countries are in, with

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unemployment skyrocketing. It's in double digits in the Big Four (Germany, France, Italy, and Spain), which account for 85% of Europe's GDP. Their pay-as-you-go pension systems are bankrupt, and getting worse as the average age of their populations increases. That's the same dilemma we face with our so-called Social Security system.

And even Japan does 70% of its importing in dollars and 40% of its exporting.

The Euro has turned out to be another of the 20th century's expensive bad ideas.

Continental Airlines

Continental, which had its problems early on, has turned out to be one of the best-run carriers. 1 travel on Continental whenever I can, and a recent incident with them just confirmed my confidence.

I sort of inherited Continental. It started for me in the 1930s with Luddington Airlines, which my father went to work for around 1932 as the passenger manager. Then, in 1934, when Tommy Luddington and Amelia Earhart, the owners of the airline, sold it to Eastern Air Transport, I started traveling on Eastern.

Eastern was great, with specials that made it ridiculously inexpensive for Sherry and me to visit Colombia, Guatemala, Martinique, Saint Martin, and so on.

Next, Eastern was bought up by Continental, so I continued buying their yearly passes, which kept the cost of my flights anywhere in the country down around \$50 each, one whale of a seniors bargain.

When Eastern and then Continental issued credit cards, Sherry and I ran as many business expenses as we could through them, making possible free flights to Europe first class!

On a recent trip to El Salvador, when I got home I discovered that someone along the way had unzipped my suitcase and stolen my two cameras (one for fast film, the other slow). I put in a claim to Continental, but I didn't expect anything to come from it but perhaps a letter of regret. Instead, I got a check covering the cost of the cameras, plus vouchers to upgrade us to first class on future flights. Wow!

But then I've always enjoyed Continental. Their service is great and their food just fine. Also, they sure cover most parts of the country.

One of these days, when I get some time (well, I suppose that's just a dream), I want to make a trip through the Pacific islands on Continental, scuba diving at Majuro, Truk, a few other islands, and then go on to Bali. It doesn't cost a lot to make a trip like that these days. Hey, maybe you'd like to come along and make it an all-ham diving trip? I'll bet we could do it in three weeks, if you can get away. Oh, you don't have the time either? Well, that's the way it is for most working stiffs.

College Choice

If you, as a parent, have decided that your teenager doesn't have the motivation (a.k.a. drive) it takes to be an entrepreneur, you'll want to make sure that he or she gets the ticket to being a lifetime working stiff for a large corporation. This requires a college degree. Since our public schools go to lengths to discourage creativity and initiative, your teen will probably fall into this category.

Now, you're faced with the choice of a college. Should you spend the big bucks for an Ivy League diploma?

Presuming that you have been "too busy"

to read any of the books I've reviewed on the subject, or bothered to get my Secret Guide to Wisdom, the bottom line is that in terms of future earnings, it doesn't make much difference what college your teen goes to. Harvey Mudd College has twice as high a percentage of graduates going on to Ph.D.s as Harvard does. A higher percentage of Cornell College (Iowa) end up in Who's Who in America than do Cornell University alumni.

Worse, it's the leading universities which have succumbed the most to providing feel-good courses. Counterculture drivel.

Yes, your kids need an education if they are going to be successful, but achieving one despite our public schools and prestige universities is a real challenge.

In my experience, there was a world of difference between the seriousness of college students in 1940, just after the depression, and those after the war, when it was "smart" to take the easiest courses and party as much as possible.

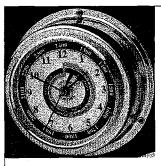
The big corporation career path is getting more and more rocky, with corporate buyouts consolidating workforces, information systems making major downsizing of management mandatory, and early retirement a practical way to cut pension overhead. This trend has been turning more and more working stiffs into just

plain stiffs.

Ham PR

You either grow or you die. The new FCC regs may help turn around the tailspin our hobby has been in and keep it from crashing

Continued on page 62



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Tony Urbizu WB4TED 599 Fernandina St. NW Palm Bay FL 32907

Try a Sensor Keyer

For almost pressure-free CW.

Just placing your finger over it will cause the transistor to close. I find it very easy to operate, and now I don't have that somehow erratic rhythm.

Iter I assembled the Heathkit HD-10 CW keyer. I noticed that because it uses one pair of microswitches, the sending was somewhat erratic. I discovered that this keyer has the versatility of allowing the hookup of an external paddle. The ones on the market are from \$15 to \$25, and some real fancy ones will go up to \$40. The price of my keyer complete will run about \$39.95; that will put the price at 100% of its value. This paddle also uses switches and contacts

in order to produce the characteristic CW rhythm.

The state of the art calls for a transistor to be a switch. Keeping this in mind, plans were laid to produce an all solid state paddle, without the need of switches or contacts.

Next, I was to produce a circuit that would amplify by the touch of the finger and act as a switch. I decided to use a Darlington pair configuration. The gain on this amplifier is about 1000.

By experiments, we know that body resistance is about 10k ohms at skin level. It will go lower in persons who have a high perspiration rate.

I then designed the pattern, which was etched out on a printed circuit board. It resembled several letter Ts together and upside down (see Fig. 2). This will cause the finger to act as a resistor when placed over it. After the etching was done, a coat of solder was laid over the design to prevent the lamination form getting tarnished — high salt content will cause this. The etching was done on both sides, to cover one side for "dots" and the other side for the "dashes."

In the schematic, we see that the emitter of Q1 is connected directly to the base of Q2. As the finger is placed

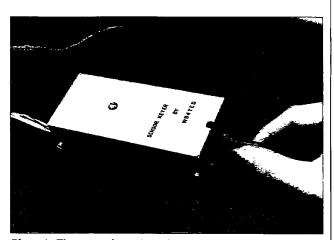


Photo A. The sensor keyer in action.

Fig. 1. R1, Re — 500Ω, 1/2 W; R2 — 3.3kΩ, 1/2 W; Q1, Q2, Q3, Q4 — 2N2222 or equivalent; ZD1 — 10 V, 0.5W 1N5240.

Reprinted from 73 Amateur Radio, January 1978.

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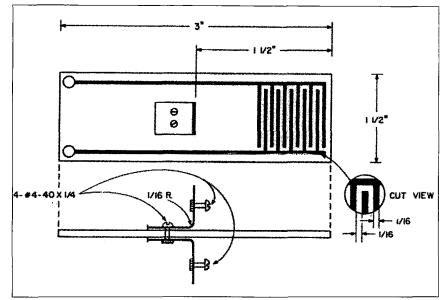


Fig. 2. Etch board on both sides.

over the etched pattern, a little current flows over to the base (Q1). (Ohm's law: I = E/R; 10 V/10k = 1 mA.)

The gain of this transistor will drive Q1 close to saturation. At the same time, Q2 will be driven to saturation, causing it to act as a switch. Presto! We now have a CW paddle.

In order to provide some voltage to the unit from the 42 volts output, we brought it from the back of the Heathkit keyer into the paddle. A 3.3k ohm resistor and a 10 V zener diode in series to ground was used, in order to produce a 10 volts bias to supply Vcc to the transistors.

Construction

Construction is made on a 2"- x 5"-x 2"-high aluminum box. A slot of about 1/8" was cut vertically on the front side, in order to allow the etched board to fit through the box. Two little brackets were formed from a 1/16" sheet of aluminum, bent 90 degrees, and attached with a #4-40 1/4" screw.

The same thing was done on the etched board.

Be cautious when placing the etched board, so it will not touch the chassis. This can be easily done with a pair of vise grips to hold it in place before you drill or punch the holes. Another PC board was etched to make the Q1, Q2, Q3, Q4, and regulating circuits. This was placed on the opposite side of the box in order to make room for about 1 or 2 pounds of lead. This is to make it heavier. (Good suppliers for lead are plumbing supply houses.) This lead was fastened to the center and attached with a #8-32 x 3"-long bolt.

The wire used to connect the back of the Heathkit keyer was #22 insulated stranded. To put on the finishing touches, 2" weather stripping was fixed to the bottom of the box so that it would have a better grip on the table or the surface where it will be placed.

The XYL, WA4FUA, has been using it for some time now. At the beginning, she found it very sensitive to operate.

She had a little difficulty in trying to get used to it, since there is no need for pushing or waiting for the switch to close. Just placing your finger

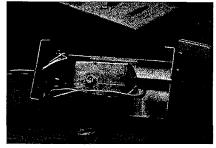


Photo B. Inside view.

over it will cause the transistor to close. I find it very easy to operate, and now I don't have that somehow erratic rhythm. —...

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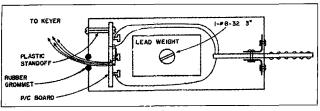


Fig. 3. Box layout, top of box looking up.

Vaya Con (Ra)Dios

The radio amateurs of Spain — part 1: Catalonia.

I always try to visit new places and see new people. I was in Spain twice before, so why did I go there again? My first trip was in 1970, and that was an "if today is Tuesday, this must be Belgium" type of country-hopping tour. I did not see much of anything. The second trip was in the late 1980s, an exclusive Spanish tour visiting about 6-7 cities in two weeks' time. This was much better, and I enjoyed every minute of it.

The deciding factor for this third visit was my excellent working relations with Xavier EA3ALV, the editor of the Spanish *CQ Radio Amateur* magazine, who translated and published several of my travelogues.

I prepared for this trip by writing to U.R.E., the Spanish Radio Amateur Association, asking their help for finding local hams. For a long time I did not receive any answer, because I addressed my mail to Angel EA1QF, U.R.E.'s General Secretary, not knowing that he lives 200 miles away and comes to Madrid only once in a while. Finally, Juan, the U.R.E.'s

Administrative Secretary, answered, and we started a kind of collaboration.

I took a New York-Barcelona nonstop Iberia flight, and in about seven hours I arrived at my destination. Xavier EA3ALV (**Photo A**) picked me up at the airport, and he was the first Spanish ham I interviewed and photographed. Xavier, first licensed in 1954, is an experimenter who likes to build electronic gadgets; he is also a contester and a DXer with 308 entities worked. He is using an FT-920 with a homemade amplifier pushing about 200-300 W into an R-7000 multiband vertical antenna. He is a good QSLer

and his E-mail address is [ea3alv @teleline.es].

Xavier's daughter Laura is EA3DBU, and her husband Albert is EC3DBZ, but they are presently inactive.

Like many wellto-do Spaniards, Xavier EA3ALV has a second house; his is outside the little village of L'Ametlla del Valles, about 22 miles north of Barcelona at about 1,760 feet above the sea. What else can a DXer dream for? There in the hills, Xavier has a 48foot tower installed on an 11-foot-high terrace. On the top of the tower, there is a 7-element yagi for 10-15-20 meters, from Force 12, an inverted V for 40 meters, and another one for 80 meters. Xavier's rig is a TS-520, with an R-4C receiver for working split, and an 800 W TL-922 type of amplifier. His brother, Ramon EA3EJI, lives a couple of streets away. Ramon, a chemical engineer licensed in 1982, is a DXer, works SSB, and has 308 entities for his DXCC.

Another amateur living in the same area is Joan-Michel EA3ADW. He was not at home when we passed by, but we saw his 6- by 17-element yagis in diamond configuration used for 2 meter EME, a 7-element yagi for 6 meters, and another yagi for 70 cm having so many elements I could not even count them.

I left my big suitcase with Xavier so that I could travel light, and went to look for a cheap hotel. It was Semana Santa, a weeklong religious holiday. I checked about 15 places until I found a

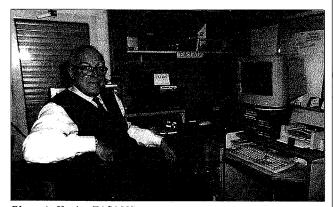


Photo A. Xavier EA3ALV.



Photo B. Jordi EA3BCU.

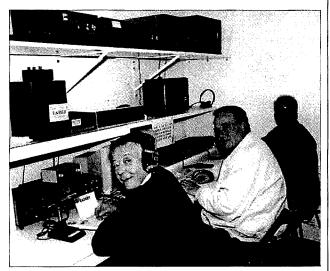


Photo C. Amadeo EA3AOY, Paco EA3PZ, and Miguel EA3ZA at the EA3MM club station, Barcelona.

hostel, close to La Rambla, the most famous tourist trap in Spain. La Rambla is a wide street starting from Plaza Catalunya and ending in the harbor.

gling, so they pay the first asked price, creating a huge profit for the storeowners.

merchants are not in souvenir stores. He said that this kind of work is below their dignity. I saw Spanish workers cleaning hotel rooms and working in restaurants for much lower income than they would make selling souvenirs; their alleged dignity costs them a lot.

> Continued on page 34

On both sides are countless souvenir shops, money exchangers, eateries, hotels, and hostels. Exclusively. Indians run the souvenir stores. I went to all of them and I did not see one single Spanish merchant or employee.

Bargaining is a necessity, because the merchandise, mostly watches. hats, t-shirts, figurines, knives, dolls and swords. is marked at 2-3 times the selling price. T-shirts, for example, marked 2.500-3500 for pesetas, can be bought for 1,300 pesetas — with the 148 pesetas to a dollar, that still comes to an expensive \$9. Most of the tourists are young, and from countries where there is no hag-

I asked a local amateur why Spanish



Photo D. Salvador EA3BKZ.

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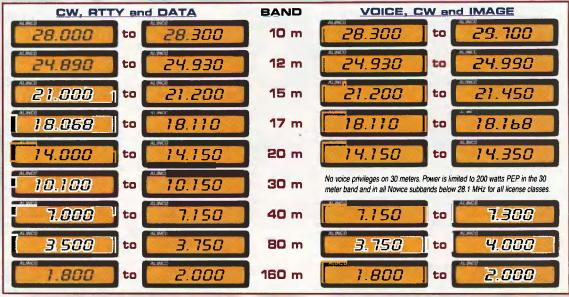
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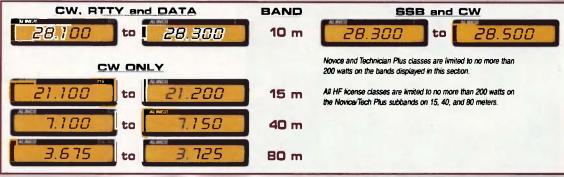
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21.025	to	21.200	15 m	21.300	to [21.450	
18.068	to	18.110	17 m	18.110	to [18.168	
14.025	to	14.150	20 m	14.225	to 🎚	14.350	
10.100	to	10.150	30 m	No voice privileges on 30 meters. It meter band and in all Novice subbi			
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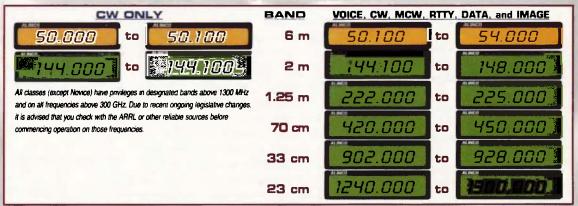


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Photo E. Arturo EA3BOA.

Vaya Con (Ra)Dios continued from page 31

About my hotel room: You've heard of a "hole in the wall" type of room? Well, my room was more of a "crack in the wall" type. It cost me 3,000 pesetas, about \$22, and included a skimpy breakfast.

Xavier took me to the offices of the Spanish CQ magazine where I met Miguel EA3DUJ, its managing editor for 15 years. I don't speak Spanish and Miguel doesn't speak English, so how come we understood each other perfectly?

Next, we went to see Ramon EA3LP, a retired radio and TV serviceman licensed in 1956. Ramon, a member of U.R.B., Unio Radioaficionats Barcelona, and the Hispano CW Club, is mainly a builder and experimenter. With a home-made rig running 2-3 W,

working mostly CW, he has made over DX 100 entities using a G5RV antenna. Ramon has several types of QSL cards.

M a r i a n o EA3FEE was the next one to visit. He has a TS-850, is running 100 W into a 5-band vertical, and worked 140 entities for his DXCC. Licensed in 1980, Mariano is a com-

puter programmer, and the creator of CATLOG, a logging program available on CD that is used by many amateurs.

Xavier also took me to Rafael EA3IH, on 6 meters using the EH3IH call. Licensed in 1949, Rafael is semiretired. He collaborates with the Spanish *CQ* magazine and with *Top Dance* publication, and worked in public relations for various car manufacturers. He used to work in contests and DX on the lower bands, making over 300 entities mostly on CW, but now prefers VHF and UHF operations. For 2 meters, he has a 19-element yagi, and on 6 meters using an HB9CV type of antenna he has already made 90 DX countries. Rafael is a good QSLer.

From Barcelona, I went on a couple of side trips to Andorra, the island of Mallorca, Madrid and Valencia, subjects of separate travelogues. For the

sake of unity, I present all of my Barcelona visits here in one single article.

Next to see was Juan EA3AUX, a retired radio-TV-electronics serviceman who started in amateur radio in 1977. He lives close to the cathedral of Sagrada Familia, and on the back of his OSL card is a

color photo of Gaudi's masterpiece. Juan has an FT-1000, an FT-575GX, a TS-520, and a bunch of telegraph keys, because he works mostly on CW. His antennas are a 3-element yagi for 10-15-20 meters and a two-band dipole for 40 and 80 meters. On the wall of his shack, I noticed a photo of HM Juan Carlos EAØJC, the king of Spain, at his radio station.

We also went to see Jordi EA3BCU (**Photo B**), licensed in 1977 and owner of a photographic supply store. Jordi has a TS-850S, a Sommerkamp FT-77, and Heathkit HW-9. He uses a Spanish-made Tagro vertical antenna for 10-15-20-40-80 meters, and a G5RV multiband dipole. Jordi built lots of equipment, and with his homemade 1 W transmitter for 15-20-40-80 meters, he has made many DXs. He also works RTTY, is on packet, and does computer logging. Jordi EA3BCU has an interesting QSL card.

In Spain, paper logging is still required, but nobody checks on that. Many hams, to comply with the rules, maintain paper logs even when they also do computer logging.

Next to visit was the radio club of the Unio Radioaficionats Barcelona. where Xavier EA3ALV is the vice president. They have a good radio station, EA3MM, where we met three operators: Amadeo EA3AOY, a carpet and drape salesman; Paco EA3PZ, a retired electronic technician; and Miguel EA3ZA, a TV service technician (Photo C). All three said that they have personal radio stations, too. The club has an employed secretary, organizes classes for licenses, and claims 843 members. Club members have free incoming and outgoing QSL service, but they pay for membership.

Spain has a rich and checkered history. The after effect of the Inquisition is still felt in some places. In a remote mountain village, a car with a foreign tourist broke down. The driver asks an old woman passing by:

"Is there a mechanic around here?"

"God forbid," answered the woman, "Here, everybody is devoted Catholic!"

Talking about devotion, a DXer tried very hard to work the last entity for his DXCC Honor Roll, but could not get through the pileup. He started to pray:

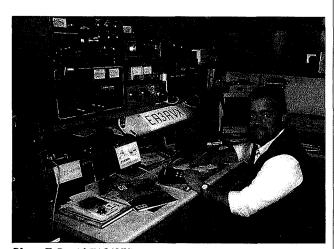


Photo F. David EA3AVX.

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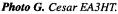




Photo H. Angela EA3AMD, Fulgencio EA3ERI, and Javier EB3FJS at the EA3RCQ radio club, Barcelona.

"Almighty God, who can do anything, please let me work this station, and I promise to give one million pesetas to the church."

In that moment the DX station is calling him and he makes the contact, logs it, and fills out a QSL card. Then he continues to pray:

"Almighty God, who can do anything, please let me now find the one million pesetas I just promised you!" Jaime EA3AJW, licensed in 1992, is

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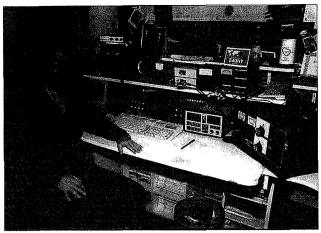


Photo I. Eduard EA3NY.

an auto mechanic. He has a 4-element vagi for 10-15-20 meters made by KLM, a dipole for 12-17-30 meters, and another dipole for 40 and 80 meters. He is a contester and a DXer with over 305 entities worked, mostly on CW (so as not to wake up at night his little girl). Jaime is on packet, has DX cluster, and uses Swisslog. He has OSL cards.

With Xavier EA3ALV, we took a trip to the city of Terrassa, where we saw four hams. The first one, Salvador EA3BKZ (Photo D), licensed in 1978, owns Astro Radio, a store where he sells (mostly by mail) antennas, Icom and MFJ equipment, and other stuff for hams. He has a TH5DX type of 5-element yagi for 10-15-20 meters; a 5-element yagi for 6 meters; a 16-element horizontally polarized yagi for 2 meters; a 21-element also horizontally polarized vagi for 70 cm, both made in



France by Tonna; a 9-element vagi for 2 meters and a 13-element yagi for 70 cm, both vertically polarized; and a G5RV wire dipole for 10 to 80 meters. For rigs, Salvador uses an IC-271E, an IC-751, a Henry Radio 2KD-5 amplifier. and KW2000E transceiver made in England. He has

worked over 200 entities, is on packet and the Internet, and does paper logging.

The second ham we saw in Terrassa was Miguel EA3EYS, a retired metal worker licensed in 1982. He has a TS-430S running 100 W to a vertical antenna for 10-15-20-40-80 meters, several VHF and UHF rigs using a 9-element vertically polarized vagi for 2 meters, and a vertical antenna for 2 meters and 70 cm. Miguel is working on SSTV using a scanner or a digital photo camera, and he showed us several pictures he received on the air. He has QSL cards.

Arturo EA3BOA (Photo E), a retired truck driver licensed in 1979, was the next ham to visit. He is a builder, and he made his power supply and built several kits for his station. His FT-277B for the lower bands is used with a G5RV, and the TM-733A/E is for 2 meters and 70 cm. On SSTV he worked almost all Europe on 2 and 20 meters, some on 80 meters. Arturo also has OSL cards.

David EA3AVX (Photo F), a dental technician, was licensed in 1996. He was the fourth ham I visited in Terrassa. He uses a TS-450S, a TS-520S, an Ameritron AL-811 amplifier, and the MFJ Tuner III. David has a yagi for 10-15-20 meters, a dipole for 40 and 80 meters, a 9-element horizontally polarized yagi for 2 meters, a 13element vertically polarized yagi for 70 cm, a vertical dualbander for 2 m and 70 cm, and three more verticals for 2 m used for packet, and SSTV.

In the Sarria section of Barcelona, I saw Jose EA3JA, a chemical engineer licensed in 1952. His antenna is a vertical MFJ-1748 for 2 to 80 meters, his rig is an IC-737A, and he uses a homemade power supply and amplifier, and an antenna tuner. He worked 150 entities for his DXCC, only on SSB; the kever I saw on his table is used only for tuning up the amplifier. His second home with a second station is in Hostalrich, about 40 miles north of Barcelona. Jose also has QSL cards, as virtually all the hams I visited had.

Cesar EA3HT (Photo G), in the San Gervasio barrio, is a communications engineer and former air traffic controller who was licensed in 1951. He has a National 200, an FR-500 receiver and FL-500 transceiver, a homemade 1/4wave ground plane for 20 meters, and a wire dipole for 10-15-20 meters. Cesar works mostly SSB and prefers 15 and 20 meters. His second home is in Torre de Claramunt, about 40 miles northwest of Barcelona, where he has a complete station with a Cushcraft ATV-5 type of antenna for 10-15-20-40-80 meters.

Radio amateurs are known to handle traffic for missionaries, medical teams. and various emergency communications, but the primary activity is still ham radio. Xavier EA3ALV took me to an amateur radio station set up only to handle communications with doctors belonging to Medicus Mundi Catalunya, working in third world countries, primarily in Angola. The operator is Xavier EC3ALP, an economist licensed in 1996 especially for this purpose. The station has a 3-element yagi and is using 100 W and a computer; it does not have QSL cards.

In the Sagrada Familia district of Barcelona, I saw the nicest radio club I ever visited, namely Quixots Internationals, with a very active station, EA3RCQ (Photo H). The club has several rooms, nicely decorated with a bunch of attractive awards. Its president is Angela EA3AMD, a photographer licensed in 1994. Her husband Luis is EB3BKE. At home, they have a TS-850, a TS-90, and a wire dipole. Angela works SSB and CW.

The club members meet on Tuesdays and Thursdays from 7 to 9 p.m.

They bring their QSLs to be mailed and pick up the ones that arrived. There are courses for CW and electronics. While there, I met many amateurs: Angel EA3BAF, Godofredo EA3AXL, Jaume EA3CSY, Pedro EA3AOP, Jose EC3DFU, Diego EA3BAS, Daniel EB3BBJ, Javier EB3FJS, Luis EA3GGY, Santos EA3AZF, Fulgencio EA3ERI, and others. Their E-mail is: [calfor@bcn.servicom.es] but they did not answer my inquiry.

When I had no visits scheduled, I went sightseeing. The huge old cathedral is very impressive indeed. The construction of the Sagrada Familia Temple is continuing at the same slow pace that I noticed 29 years ago. In 1970, 1 asked our guide:

"When they finish it?"

"Never, because they keep collecting money to work on it, and once the job is finished they can not collect anymore!" I believe that guide was on to something.

I am sorry that I did not go to the aquarium, supposedly the best in the world. However, I did go to the Museum of Contemporary Art. I paid 750 pesetas to enter a nice modern building. but I did not see too much inside.

At an exhibition of modern art, a visitor looking at a painting exclaims laughingly:

"I never saw an angel with six fingers!"

The artist who overheard the uncomplimentary remark answered with indignation:

"Did you ever see an angel with five fingers?"

I also saw the Picasso Museum. I paid 700 pesetas to see it; I liked the ceramics and painting section but did not care at all about his engravings. I particularly like a painting called "Portrait of Madame Canals." You know, the kind of portrait that no matter from which angle you look at the sitter, it seems that the sitter looks at you. It becomes a personal relation, an interactive situation, to use today's expression. Well, I liked Madame Canals a lot, but from any angle I looked at her, she just looked over my head. I kept moving back and forth in front of her maybe, just maybe, she would look back at me, but she continued to ignore me. I even pretended that I was leaving the room and then quickly turned around, hoping that I would catch a glance of her - but nothing: She pretended that I was not even there. I left the museum depressed and disappointed.

The next morning, I went to Andorra, returning two days later and continuing to visit the Barcelona hams.

The first to see was Eduard, or Eddie EA3NY. (Photo I), owner of Bit Radio, a store dedicated to the needs of the radio amateurs: antennas, transceivers, and various accessories. Eddie, a graduate of the University of Telecommunications of Barcelona, was

licensed in 1987; he worked for Kenwood and opened his store 12 years ago. His contest and DXing station is installed in his father's penthouse, on the 10th floor of a tall building in the village of Esplugas, just outside the big city. His 48-foot tower is on the roof, about 150 feet from the ground. with an unobstructed view all around. Eddie has a Cushcraft X9 vagi with an additional element for 40 meters, a fixed 10 to 40 meter single-element rigid dipole for checking propagation and multipliers with a TS-570D, and a sloper for 80 meters. He is using an FT-1000 and a big amplifier. The legal



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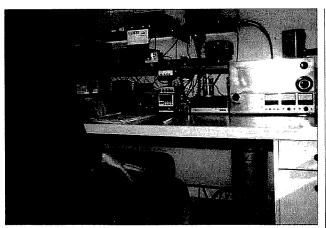


Photo K. José EA3DXU.

limit in Spain is 800 W, but during my visits I saw several 2–3 kW amplifiers.

Eddie EA3NY is a DXer with over 300 entities worked. A contester and DXpeditioner, he has operated as ED3NY, AM3NY, S07NY (Western Sahara), FS5PL, FG5BG, EA8ZS, EA9AM, EA6URP, and F/EA3NY/P from EU-064, all with excellent results. He has QSL cards, and his Email is [ea3ny@writeme.com].

Eddie was on the phone for two entire hours setting up appointments for me to meet with local hams, as well as with some in Valencia, where he advised me to go.

Jordi EA3GEP, an elementary school teacher and licensed in 1989, was the next to see. He has a 35-loot tower installed on a roof 80 feet from the ground. Jordi has a 3-element TH-3 Jr. yagi for 10-15-20 meters, a single-element monobander for 17 meters, an inverted V for 40 and 80 meters, and a

double sloper for 40 meters. His rig is a TS-850S followed by an SB-1000 amplifier. Jordi EA3GEP is a builder, contester, and DXer with over 275 entities, and is using Swisslog. He has a nice QSL card.

The next ham to see was Ramon EA3KB, licensed in 1982 and owner of a food store.

His 38-foot tower, installed on the roof 96 feet from ground, is supporting an A4-type Cushcraft 4-element yagi for 10-15-20 meters, with an extra element for 40 meters, a single-element rigid Cushcraft yagi for 12-17-30 meters, and an inverted V for 80 meters. He has an IC-751A and an AL-811 Ameritron amplifier running 700 W. For logging, Ramon is using the PLOG program made in Spain, and Swisslog. He has worked 327 entities, and has 5BDXCC and many difficult-to-obtain awards. He is a DXer and an island chaser, having certificate #1 of the Spanish Islands Award, and he has worked 726 IOTA islands. Ramon EA3KB has two kinds of QSLs, one with a color photo showing the Barcelona Olympic Port. He has worked both EAØJC and JYI.

Eddie EA3NY arranged for Juan EA3EM (**Photo J**) to meet me at a certain metro (subway) station and

recognize me by my cap with my name and call. Juan first took me to the city of Sta. Perpetua de Mogoda, about 7 miles away from Barcelona, to see José EA3DXU (Photo K), an electronics engineer licensed in 1982. José is known for his EME work! He has made over 2000 QSOs on 2 meter EME, with 363 different stations in over 60 countries, all on CW. His 2 meter EME transmitter starts with a Standard C58, followed by a Standard CPB-58, which leads to a Mirage B108, and finally to a homemade 2.6 kW amplifier using a 4CX1500B tube. His 70 cm transmitter starts with a TS-790E and is followed by a 1.4 kW amplifier made by LZ2US, with a GS23B Russian-made tube. José's tower is 35 feet high, installed 25 feet from ground. He has a double 17-element yagi for 2 meters, and a double 38-element yagi for 70 cm, both from K6MYC. He works only VHF and UHF, and is using 20 meters only to arrange schedules for EME.

Next, Juan EA3EM took me to his station in La Llagosta. Licensed in 1985, Juan is a truck driver delivering cosmetics all over the province. His tower stands 29 feet tall on the top of his house, 38 feet from ground. He has a Hy-Gain TH-3 Jr.3-element yagi for 10-15-20 meters, a homemade 5-element yagi for 6 meters, two 17-element 17B2-type Cushcraft yagis for 2 meters, and an inverted V for 40 and 80 meters. Juan is a contester and DXer, using 500 W on SSB and CW. He has QSL cards, and his E-mail is [ea3em@intercom.es].

Continuing the visit, Juan took me to L'Hospitalet de Llobregat, right near Barcelona, to see Manuel EA3BIG (Photo L). Licensed in 1978, Manuel is a technical director in a company doing electrical installations. As the president of the Radio Amateur Association of Catalonia, Manuel is doing mainly organizational work; for example, he installed and ran an amateur radio station at the 1992 Barcelona Olympic Games, using the EGØJOB and EHØJOB callsigns. His 38-foothigh tower stands on the roof 32 feet from ground. He has a 3-element yagi for 10-15-20 meters, an inverted V for 40 and 80 meters, a 15-element yagi for 2 meters, and a 23-element yagi for 70 cm, both horizontally polarized. Manuel works some 2 meter contests, sometimes operates SSB on 20 and 40 meters, and has QSL cards.

With Manuel EA3BIG, Juan EA3EM, and Jaume EA3CT, we had a long discussion about how amateur radio is

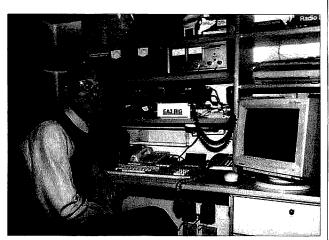


Photo L. Manuel EA3BIG.

organized in the U.S. Jaume facilitated the conversations by doing some translations. His wife Rosa-Maria is EA3ANY.

Next day, I went to the Les Corts section of the town to visit Luis EA3OG, an editor and publisher of children's books, licensed in 1961.

He is using a Drake TR7 with the MN7; for satellite work. Luis has an IC-245E for 2 meters and an FT-780R for 70 cm. For tracking satellites, he is using the INSTANTTRACK program. Luis works SSB, CW, and RTTY, is on packet, has DX cluster, and does computer logging. He has a nice OSL. In his second home in Villassar de Mar, about 16 miles from Barcelona. Luis has a Titan Gap for 10 to 80 meters, an IC-455, a TS-711E for 2 meters, and a TS-811E for 70 cm.

I had three Barcelona experiences I would like to mention:

- 1.1 was eating at Burger King and a stranger sat near me without having any meals. He was fidgeting for a while, then placed his jacket on a chair nearby on which were the belongings of two ladies from France, stretched his hand under his jacket and took a handbag. Another tourist saw this maneuver and intervened, even going outside and bringing two cops, who took the stranger away.
- 2. At a subway station, I was trying to get in a car, but a man acting hesitant and confused was blocking the entrance. I pushed him with both of my hands and in that moment another man unbuttoned my back pocket and put his hand in. I felt it, turned around and slapped his hand yelling "You dirty thief!" and other less than flattering remarks. The two men left the train before the doors closed. The people around me had no reaction; or maybe they did not understand what happened, or else they were too accustomed to such events.
- 3. My "crack in the wall" type of room had no inside doorlock, so every evening I placed a chair near the door. One night, somebody opened my door and pushed it, but could not enter. I woke up wondering if the would-be intruder had been a female and that had been my lucky day, or if it had been a

man looking for some extra cash. I called up the front desk and told the clerk what happened. He said, "That's OK ..." and hung up. I guess that was no news to him.

I met Magi EA3UM (Photo M) at the statue of Columbus, right near the harbor, again prearranged, and wearing my cap with my name and call on it. He took me to his house in Castelldefels. Magi, a communications engineer licensed in 1968, owns a microwave communications company near the airport. I saw parts of his company, with people working or just hanging around, through his security cameras linked by microwaves to his home. Magi is active on EME, SSTV, ATV, SSB, CW, and RTTY; there is not too much left after these.

He has a 70-foot tower with a personal elevator, and on its top is a 22.5-foot parabolic dish for EME. On a building separate from the main house, where he has his radio station, workshop, etc., there is a dish almost 6 feet in diameter for TV satellite reception, and an 11-foot dish for 13 cm SETI, always receiving.

Magi is a coordinator for SETI, the Search for Extra Terrestrial Intelligence. I noticed that his antenna for SETI is pointed to outer space, probably because there is not much intelligence found on Earth (see the constant wars among people). Magi has a roomful of equipment; an IC-R70 general coverage receiver for 100 kHz to 30 MHz, the R-4B and T-4XB pair from Drake, an IC-R8500 receiver for 100



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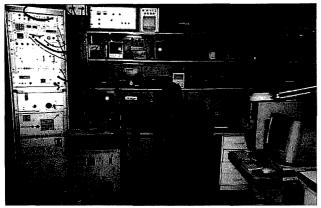


Photo M. Magi EA3UM.

kHz to 2 GHz, a TS-780 rig for 2 meters and 70 cm, an IC-1271E for 23 cm, and a 1kW amplifier for 6-10-15-20 meters. On a separate rack, he has all homemade equipment: a rig for ATV, antenna movement controller, various converters, amplifiers for 23 cm, amplifier for ATV and for 70 cm EME. His powers used on EME are: 2 kW on 70 cm, 2 kW on 23 cm, and 1 kW on 13 cm. Magi has a QSL showing his EME dish.

I went to see Alberto EA3CR, outside the village of Guardiola de Fontrubi. An insurance broker, he started in amateur radio in 1974. He has a 65-foot tower on the hills, 1280 feet above the sea level. He uses a 5-element monobander from KLM, on a 42-foot boom; an inverted V for 40 meters; and another one for 80 meters. Soon, he will install his new Hy-Gain 105CA monobander for 10 meters, on a 24-foot-long boom. The tower can be loaded for 80 and 160 meters with an

outdoor matching device. For reception on the 160 meter band, Alberto has an EWE type of wire antenna, similar to a Beverage, but much shorter. He uses an FT-1000 with an Ulvin Tremendus III amplifier running 2 kW output, and an FT-221R for 2 meters. Alberto works

SSB, CW, and SSTV, and has 318 entities for his DXCC.

About working DX, I liked the riddle posed by Rod AC6V:

"How many ham radio operators does it take to constitute a pileup?"

"25 — the callee, a caller, and 23 cops telling them that he is listing up!"

Again prearranged, I met Juanjo EA3CB where Plaza Catalunya meets La Rambla. He took me to Vilanova i la Geltru, 28 miles from Barcelona. Juanjo's full name is Joan Josep Mota i Tarruella, and who can top that? I noticed that many Spaniards have very long names and live in places with similarly long names. Is this the reason that no Spanish *Callbook* was published for five years? Perhaps too many words require too much work.

Juanjo, licensed in 1979, is a broadcast technician for an FM radio station. His 34-foot tower sits on a 64-foothigh roof. He has an Explorer 14; a 4element yagi for 10-15-20 meters from Hy-Gain; an inverted V for 30-40-80 meters; a ground plane for 2 meters; and another one for 2 meters and 70 cm. Juanjo is using the R-4C, T-4XC with the L7 amplifier, pushing about 900 W. He works SSB, CW, RTTY, and some SSTV. For logging he is using DX4WIN. He is the vice president of the prestigious Lynx DX Group, has worked 325 entities, and EAØJC, second operator José. Juanjo worked as SV8/EA3CB/p, SV9/EA3CB/p, FG/ EA3CB/p and in group operation as SØA (for CWØ), and SØ2R (for SSB). He has a nice photo QSL card showing the operator at his station and his tower with his antenna. His E-mail is not easy to remember: [L124808303@ abonados.cplus.es].

Also in Vilanova, we visited Arsenio EA3NI, a retired electro-domestic storeowner. He started in amateur radio in 1960. He has two towers on his 48foot-high roof: a 30-footer has a Hy-Gain TH5DX 5-element yagi for 10-15-20 meters, and the other one, about 35 feet long, carries his homemade 5-element yagi for 6 meters. He also has a longwire for 30-40-80-160 meters, a dipole for 80 meters, and a 4-element antenna for 2 meter packet cluster. Arsenio uses an IC-751A and a TS-830S, and has two amplifiers; one homemade runs about 400 W, the second about 1 kW. He uses a computer for logging with the DXLOG program, and has worked 343 entities, mostly on SSB. He has OSL cards. Now his brother Clemente EA3VM is running the store.

Continued on page 59



Photo N. Pere EA3A.JI.



Photo O. Miquel EA3NB.

Radio Direction Finding

Joe Moell P.E. KØOV P.O. Box 2508 Fullerton CA 92837 [Homingin@aol.com] [http://www.homingin.com]

ARDF Takes Off in 2000

Have you tried hidden transmitter hunting in the woods yet? Whether you call it foxhunting, foxtailing, radio-orienteering or ARDF, the year 2000 will bring more of it to more places in the USA than ever before.

Five years ago, only a handful of stateside hams had experienced international-style foxhunting, even though it had already been popular in some countries of Europe and Asia for fifteen years. After inroads were made by the Friendship Amateur Radio Society (FARS) of Portland, Oregon, we sent a small team of self-admitted beginners to the ARDF World Championships in Hungary during September 1998. "Homing In" had photos and stories in the January 1999 issue.

This led to FARS staging the first multination ARDF contest in the USA to be sanctioned by the International Amateur Radio Union (IARU). Eight states and eight foreign countries were represented at this event, held in Portland in August 1999. Again, you read it in "Homing In" — see the October 1999 issue.

Without exception, the stateside participants returned to their hometowns as enthusiastic ambassadors of ARDF. For instance, Marvin Johnston KE6HTS is busily planning ARDF adventures for members of the Santa Barbara Amateur Radio Club (SBARC). His zeal for the sport had already brought Mike and Brian Peddicord (KE6OTM and KF6DZN) to the 1999 Portland Championships. Now more hams in his area are catching foxhunting fever, following this year's first SBARC on-foot hunt on March 18.

As past president of SBARC, experienced

in organizing several ham radio conventions, Marvin understands the intricacies of financing large amateur radio endeavors. He's working to find creative funding opportunities for future ARDF championship events. If you have ideas, I'm sure he would be eager to discuss them with you.



Photo A. Jay Thompson W6JAY had just turned 14 when he won medals in the Portland championships. Here he demonstrates how a simple beam of PVC pipe and steel tape, plus an offset attenuator, is all you need to go foxhunting with a two-meter handie-talkie. Beside him is his father, Richard WA6NOL.

Creative designers sought

On the technical side, work continues to make affordable ARDF equipment available to hams in this hemisphere.

There are "de facto standard" receiver/antenna sets for each ARDF band (80-meter CW and 2-meter AM) in many countries of Europe and Asia. Most of these sets aren't the ideal here. For instance, the wide IF stages of Russian "Altai" two-meter ARDF units are sometimes incompatible with crowded USA band conditions.

Most foreign-made two-meter ARDF sets have AM detectors, but FM is the most popular stateside mode. FM signals can be slope-detected on these AM sets, but that makes the modulation difficult to copy. Audio strength indicators are less effective when the signal is tuned off-center. Despite this, ARDF sets from Ron Graham Electronics in Australia have found favor among many radio-orienteers here. "Homing In" for December 1997 has a product review.

Mizuho, a Japanese company, makes synthesized ARDF sets with selectable AM/FM modes for two meters. They are not imported by any USA dealers, nor have they been FCC certified. One reason might be the anticipated price. It's hard to imagine equipping a Scout troop with lots of ARDF units if each one costs several hundred dollars.

So here's the challenge: Let's find a way to import or manufacture some effective and affordable ARDF receiver/antenna sets, either kit or wired/tested. That's one way to make plenty of them available to budding foxhunters of all ages.

Fortunately, it's already possible for you to get started in two-meter ARDF at very low cost, if you have a handie-talkie or pocket scanner that covers the band. Just build a simple beam or quad, plus an offset attenuator. The beam shouldn't cost more than ten dollars and the offset attenuator can be built for about 15 bucks from parts you can probably find locally (**Photo A**). Check

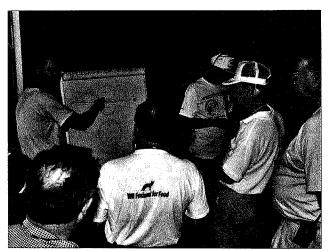


Photo B. Rik Strobbe ONTYD, Interim Chair of the ARDF Working Group of IARU Region 1 (Europe and Africa), gave important lessons to both competitors and event organizers at the Portland championships last year. He also provided some 80 meter ARDF gear.

your back issues of 73 for "Homing In" plans (the May 1996 and May 1998 issues, for instance) or visit my Web site.

Eighty-meter ARDF is another matter. We're very new at it. In fact, the very first 80m radio-orienteering event on this continent was at the Portland championships last year. Almost all of the receiver/antenna sets used by Team USA were on loan from the European visitors, including Rik Strobbe

ON7YD of Belgium (**Photo B**) and Panayot Danev LZ1US of Bulgaria.

Groundwave signals on 80m tend to follow the curvature of the Earth. They don't reflect from buildings, mountains, and trees as two-meter signals often do. That makes 80m ARDF much more straightforward. Worldwide, the winning times on 80m hunts are almost always shorter than those of 2m hunts on the same size courses. For that reason, 80m

may be the better band for introducing youth and Scouts to the sport.

Harley Leach KI7XF is one of several Portland attendees who are now promoting 80m ARDF. Harley, who teaches electrical engineering at Montana State University, surprised everyone by his performance at Portland, considering that he had very little prior ARDF experience. Now KI7XF has obtained European-made 80m ARDF kits

for several ARDFers here. We're evaluating them to see if the design is suitable, prior to ordering more.

DFer Jerry Boyd WB8WFK of Albuquerque, New Mexico. was the only Team USA 1999 member to bring his own 80m ARDF set to Portland. He built it himself and still continues to optimize his design, experimenting with both circular loop and ferrite rod RDF antennas for that band. I'm sure that he would welcome the opportunity to exchange correspondence with other 80m ARDF receiver experimenters. I would, too.



Photo C. Bob Frey WA6EZV slimmed down and shaped up to prepare for Portland, and his efforts were rewarded with medals. Now he's organizing events and promoting the sport in the Midwest.

The orienteering connection

From their homes in the Cincinnati area, Bob Frey WA6EZV (**Photo** C) and Dick Arnett WB4SUV are promoting ARDF over a wide area of the Midwest, emphasizing the physical and orienteering aspects of the sport. First introduced to it at the Dayton HamventionTM Foxhunting Forum that they hosted last year, both have pursued personal training programs that are likely to make them serious medal contenders in future championships.

As part of their outreach efforts, Cincinnati foxhunters introduced the sport to 60 Scouts from seven troops at the annual Jamboree-on-the-Air (JOTA) last fall. WA6EZV and WB4SUV first divided the Scouts into groups of six and taught them the principles of direction-finding, including the functions of directional antennas and attenuators. The Scouts then paired off and tried it for themselves. Bill Schroeder WD6ADM and Stuart Press KC8HQT assisted Bob and Dick with help to the Scout pairs.

Now it was time for a contest. Teams of two Scouts from each of the troops were selected and the clock was started. Which troop's team would win by finding the two hidden transmitters in the shortest time, without assistance? The competition was fierce, and apparently the training was very good, as all the finishes were within about ten minutes of each other. There's no doubt that this contest whetted their appetites for more. As WA6EZV wrote, "Repetitive requests to 'do it again' provided us with the satisfaction that the Scouts indeed enjoyed the event and gave us a feeling that the day was well spent."

The next Cincinnati-area ARDF event for all ages will be on Sunday, May 7, at McFarland Woods, sponsored by the OH-KY-IN Amateur Radio Society and the Cincinnati Orienteering Group (OCIN). An hour of training and demonstrations will be begin at 10 a.m., followed by four hours of foxhunting starting at 11. Both 80-meter and two-meter courses will be provided. A limited number of receiver/antenna sets for both bands will be available for loan.

If you're heading for the Dayton Hamvention in May, be sure to take your on-foot RDF gear for two meters. WA6EZV and WB4SUV promise that there will be another prize-filled foxhunt to challenge you, just like the 1999 hunt that was described in "Homing In" last September. Well, it won't be "just like" last year — they say they have some new surprises in store.

The Hamvention's Foxhunting Forum is a great place to hear about the latest RDF news and technologies. This year's scheduled

speakers include Jacques Brodeur VE2EMM with his microprocessor-based mobile Doppler set, and Brian De Young KE4HOR with his new laptop bearing display interface. Start times of the forum and foxhunt aren't firm as of this writing, but the information should be on the "Homing In" Web site by the time you read this.

WA6EZV and WB4SUV are working with Sam Smith N4MAP of Atlanta to bring the sport to southeastern states. Sam, who is active in the Georgia Orienteering Club (GAOC), put on his first full-scale radio-orienteering event in conjunction with a classic orienteering meet last October 30 at Cochran Mill. Sixty persons attended this combined event.

Another Atlanta area radio-orienteering event followed in the next month. Two more will have been held by the time this issue reaches you. The next one is scheduled for April 30 at Red Top Mountain State Park near Cartersville, GA. Like the Cincinnati event the next week, training will begin at 10 a.m., with the hunt at 11. For more information, contact N4MAP at his *Callbook* address, or via the E-mail and Web links at the "Homing In" site.

Next, the world

European and Asian ARDF champions are some of the most fierce competitors around, but they are also some of the most friendly and helpful hams that you will ever meet. Since the USA first arrived on the world ARDF scene, these champs have welcomed, supported, and encouraged us every step of the way. They want us to succeed.

The invitation I received today for USA hams to participate as visitors at a Ukrainian ARDF event in mid-April is just one of many that now arrive regularly. We aren't yet ready to send large teams to these European and Asian national hunts, but unattached individuals are usually welcomed. So if you would like to add ARDF to your next overseas vacation, contact me or get on the Web to find out what opportunities are available.

The biggest event for Team USA this year will be the ARDF World Championships, taking place in Nanjing, China, from October 13 through 18. The Chinese Radiosports Association (CRSA) is planning a full program of cultural and tourist activities, in addition to world-class courses on both ARDF bands.

Twelve hams from seven states have already expressed interest in traveling to this event. We can send up to three competitors per division. Age divisions are Juniors (under age 19), Seniors (19 through 39), Old-

Timers (40 through 54), and Veterans (55 and over). As of this writing, CRSA has not announced if there will be separate age divisions for women or if all women will compete in one division.

There's room for more on ARDF Team USA 2000. You don't have to be a star athlete, but you should be able to walk, jog, or run through forest trails for a two-hour period. Family members may accompany competitors to the festivities and foxhunt venues, but they cannot go out on the courses.

To view the official invitation to the championships and the latest information about Team USA, visit the "Homing In" Web site. To be added to the list of prospective Team USA members and get answers to your questions about our team, contact me via electronic or postal mail. Time is of essence, because diplomatic and travel arrangements must be made well in advance.

Team USA membership is limited to persons with USA citizenship or resident alien status. To be considered for another country's team, contact that country's national Amateur Radio society. For instance, in Canada, contact Radio Amateurs of Canada (RAC). RAC's ARDF Coordinator is Perry Creighton VA7PC.

Here in IARU Region 2, only USA and Canada have ARDF Coordinators at this time. If you wish to represent any other country in North or South America at the Championships, please contact both your national society and me.

Whether you're a marathoner or a "shack potato," you can help ARDF promote our hobby and increase international goodwill. Work with your local club leaders to schedule and organize foxhunts. Warm up the soldering iron, clean the clutter from the

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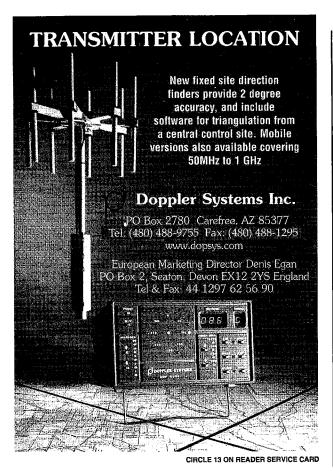
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workbench and build some fox transmitters, antennas, and attenuators. Talk up ARDF among youth and Scout leaders in your town.

When you're in a ham radio QSO, don't forget to mention your foxhunting activities. A discussion of your latest RDF equipment project or tales of your last competition might result in more participants at your club's next foxhunt. Don't limit your ARDF talk to the local repeater mention your interest on the DX bands, too. We need to encourage more countries to develop ARDF programs, particularly here in the Western Hemisphere. As IARU's ARDF Coordinator for Region 2 (North and South America), I want to hear from anyone on these two continents who wants to get the ARDF bail rolling.

From foxes to owls

Once you have learned the basics of tracking virtual foxes in the woods, consider using your skills to help save a real threatened species. You may even be able to help from the comfort of your hamshack. More volunteers are needed for the Burrowing Owl Project. Fortyeight of these creatures, fitted with miniature radio transmitters between 172 and 173 MHz, migrated from Saskatchewan and Alberta in the fall. Where are they now?

Most likely they spent the winter in southwestern and south central states. Some might have ended up in northern Mexico. They are probably beginning to head northward again for the spring breeding season as this issue arrives. But no one knows for sure. That's where you come in.

The 1999 fall migration monitoring project was announced in the amateur radio press in late September. On October 5, Peter Vekinis KC1QF monitored the 172 MHz band from an aircraft over portions of Arizona, New Mexico, and Colorado. He reported a pulsed signal near Interstate 10 southeast of Tucson, copyable for about five miles of his travel. This signal was not confirmed on the ground.

On October 11, Robert Lentz K5BL reported a pulsed signal on a different frequency at his home near McKinney, Texas, which is about 33 miles NNE of downtown Dallas. The signal was audible for several hours, but was not tracked down. Then on December 27, James Kaelin K5DXM received weak pulsed signals in Lavaca, Arkansas, 14 miles east of Fort Smith. Frequency was the same as the signal heard by K5BL. K5DXM's beam indicated northward direction. The signal disappeared after two days.

Based on these reports, I increased the winter monitoring area to include all southern states from California (Imperial Valley and points east) through Arkansas and Louisiana. During the anticipated northward migratory period from late March through early May, monitors are needed from these areas northward through Montana and North Dakota.

If you have a sensitive receiver, scanner, or wide-range handie-talkie that tunes up to 173 MHz, you can join the effort. If you have radio direction-finding gear for that frequency range, so much the better. Perhaps you'll be the first to sight a living banded Canadian burrowing owl in the USA.

For all the details, see the burrowing owl page of the "Homing In" Web site. You'll learn more about this interesting species of owl, which prefers living underground in grasslands and deserts instead of perching in trees. There's also a list of the 33 still-active bio-tag frequencies and information about suitable equipment for monitoring and RDF at 172 MHz. Most important of all, there's information on what to do if you receive a tag signal. To those of who have faithfully monitored since September, please accept my sincere thanks, plus the thanks of the Canadian researchers.



Low Power Operation

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The Vectronics VEC1340K

There's no question about it, running QRP is as simple as reducing the power of your transmitter. Lots of people have tried QRP this way and have found it very enjoyable. On the other hand, if you don't like to be 549 all the time, you can crank up the power and go on with your hamming. You're not out any money, just some time.

B ut, for the real fun of QRP, you just have to have a QSO with a station with equipment you have built yourself. There's zillions of kits and construction articles around. If you're not into building from scratch, then the use of a kit is the best bet going.

In the not too distant past, most of the QRP kits were simple crystal controlled transmitters. You used your transceiver or station receiver and transmitted with the kit. It was simple and easy to do. All you had to come up with was a suitable transmit and receiver switching scheme.

However, today's QRP kits offer microprocessor control and computer interfaces. For a first time kit builder, they can become a major project. Thankfully, there's a new company that is offering a smattering of kits, including several QRP transmitters and QRP transceivers. I am talking about Vectronics.

The Vectronics kit VEC1340K is a QRP transceiver for the 40 meter band. It's CW only and uses a VXO for tuning.

A closer look at the Vectronics QRP transceiver

The Vectronics is based on some rather simple designs. The direct conversion receiver is mated to a three-stage CW transmitter. The operating frequency is controlled by a VXO. The receiver is a direct conversion unit that uses a NE602 and a LM386. The NE602 is both the VFO mixer and product detector. The LM386 provides speaker volume and is the only active device in the audio chain.

A brute force RF gain control is ahead of a simple tuned circuit before the NE602. The tuned filter is designed to allow the required signals into the mixer and yet keep unwanted signals out.

After the VXO signal and the incoming signals mix, the output is fed directly into the audio amplifier. There are no high or low pass filters in the audio chain.

A crystal controls the transmitter. The crystal for the QRP calling frequencies is included in the kit. A variable capacitor is used to control the VXO. From the VXO, the signal is buffered by a driver stage before being sent along to the final transistor, a 2N3055. The transmitter will produce over one watt of RF at 12.5 volts.

The entire Vectronics transceiver is built on a single-sided PC board that measures 4-3/4" by 5-1/4" inches. The PC board is epoxy glass with a solder mask on the copper side. There is a clear component silk screen on the component side. The board does not have plated holes, nor is it solderplated. The transceiver is protected from reverse polarity by a diode and PC fuse. That's something you don't usually see in a kit in this price class.

Building the Vectronics transceiver

This is a simple kit to assemble. If you have ever melted solder, you can easily construct this transceiver. For such a simple kit, the instruction manual weighs in at over 37 pages.

There's ample information about inserting the parts and basic soldering. There's even a section on identifying the various resistors and capacitors. Although not a Heathkit by any means, the check-off-asyou-stuff instructions just about eliminate any misplaced parts.

Construction is basic. You start with the resistors, add the capacitors, and semiconductors, and then install the frequency-

dependent component. Since the kit can cover many bands, you must be sure you are looking at the correct section before stuffing these parts in. I almost goofed up and was about to install the parts for 80 meters when in fact I had the kit for 40 meters. No, you don't get the parts for all the other bands, but the instructions are printed in the manual to cover 80, 40, 30, and 20 meters. It's easy to get lost, so be careful when installing these parts.

Speaking of frequency-dependent components, you have to wind two toroids in this transceiver. It's not that Earth-shattering and the instructions are crystal clear. In fact, you don't even have to scrape the enamel off the wires. Vectronics uses a heat-strippable wire for the toroids. You simply heat the wire with your soldering iron and the insulation melts right off! Tin the wires with some solder, and stuff the toroids on the PC board.

During construction, there was nothing unusual that popped up. No surprises! The rest of construction is basically installing the various switches and jacks. The antenna jack is for an RCA-type plug.

The VXO capacitor is a 365 mF unit designed for broadcast radios. It's held in place with a hunk of double-sided tape. There are two ground wires that help hold the capacitor. Thank goodness that Vectronics included the most needed and the almost impossible to find — the adapter to fit a knob to the VXC capacitor!

Testing the Vectronics transceiver

All you need is a power supply capable of 12-14 volts at 500 mA and a dummy load

Continued on page 59

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More Than You Can Shake a Digital Stick At

More new stuff coming at you these days than you can shake a stick at. I heard people talking about the DigiPan program for PSK31, and that sounded like a must-have. Or at least I didn't want to be left out in the dark at discussion time, so here goes.

I certainly have to agree with the premise that the program was developed for ease of use. It is that for sure. I downloaded it. opened it up, and looked for a manual. From the site where I downloaded, there was no sign of a manual as an extra file, nor did one show up after the unzipping process.

This program is about as user-friendly as they get. Having used other programs for PSK31, this was a snap to get up and running without any fancy written instructions. This is possibly an overstatement, because there is an adequate on-line answer man in the form of a well-written help file. And I spoke with at least one DigiPan user who swore that there is a manual and he printed and read it from front to back.

The program's claim to fame is that the user has a panoramic view of the section of the band showing every signal for at least

300 Hz across the bottom of the screen! I had heard of it, but had to see it to believe it. See **Fig. 1**.

As you can see, the full width of the bottom section of the monitor image is a spectrum display. This pretty well covers the PSK31 window on 20 meters, so you can observe where the latest warble is located in relation to where you are tuned. If you look carefully for the diamond in the center of the display, that was where I was tuned at the time of the screen shot.

There are several interesting features connected to this portion of the program. One is that you can tune automatically to a different signal simply by clicking on that signal. The diamond moves to perfectly line up, and you begin a screen print of that signal. This means there is little need to twist the knob on the radio to work the entire window. The downside is that you never know exactly what the frequency of the signal is. This isn't a real problem, since you are not at a band edge, but it is a little disconcerting at first.

Another clever byproduct you will discover is that you can check the effectiveness of your filters. I discovered this as I adjusted the passband tune on the Icom 735 and watched the adjacent signals and other noise disappear as if by magic while I was listening to the effect. It's fun to play with. I talked to one ham with more optional filters than I have, and he had checked these in the same manner. I think he said he had a narrow CW filter he switched in.

There is a small controversy about methods of using the narrow CW filter some have in our rigs with the PSK31 programs. I tried it one day by switching to CW and tuning to an incoming signal. The copy was terrific, but the rig doesn't transmit PSK31 on the CW mode. When I went back to sideband, I was off frequency. This experiment,

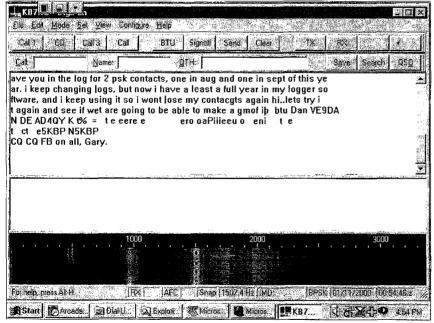


Fig. 1. This is the DigiPan screen. How many signals are there? Study the wide spectrum waterfall at the bottom of the screen. The copy in the receive screen doesn't make sense as I was tuning from one to another of the several signals, all concurrently transmitting. At the far left, above the "Alt-H" is a nice clean signal just begun a few seconds prior to snapping this screen. The next two appear wide in the display, though they were better looking (narrow) on the screen. The next two are parts of the same PACTOR signal. Gives you an idea of the efficiency of the PSK31 signals, especially when you compare the throughput at similar S/N ratios. Also, note the diamond in the center of the spectrum. That is where the system is currently tuned. To go to another signal, you can simply click on the waterfall for that signal and you are there.

I believe, was using Logger, though the program makes no difference.

Another revelation with the DigiPan program is that you will see the RTTY and TOR signals that are close by, which will give you an appreciation for the narrow bandwidth of PSK31.1 find that extremely loud adjacent signals of any form have a tendency to overload the system, and I lose copy in the PSK mode. I hear that is true from other hams. The only difference comes in the individual rig's ability to reject these

Hence the need for filtering ahead of the audio section. Since the time of the experiment with the CW mode with the narrow filter, I have located a split frequency program that is purported to allow adjustment to automatically compensate for receiving one mode and transmitting the other. The installation and implementation appear to be causing undue stress in the thinking area. I will get back to it, and let you know when I get good results.

Another handy feature of the DigiPan program is its ease of logging. Though it wasn't developed as a logging program, you are able to record PSK31 QSOs and recall them to the screen. I didn't find any way to print the log, but, again, it is not a logging program.

I've had a few other learning incidents recently. I don't claim to be a contest type, but I find some of these ethereal gettogethers irresistible and give them a go. I find some of the results of my efforts amusing at best, but there are things to be learned from these activities.

As most of us realize, PSK31 doesn't work unless it is tuned precisely, and that is the reason for the AFC and the NET functions in the programs. I find it difficult to believe, but I have observed stations answering a CQ call a full 30 Hz off frequency. I wonder what they are thinking. Dead center doesn't seem close enough much of the time in those contests.

Tongue-in-cheek thought (no sour grapes intended!): I found that my peanut whistle PSK31 station seems to be copied quite easily as long as it is not contest time. I listened to and answered several stations' CO Test and they seemed not to hear me at all. Watching other stations from my neck of the woods call the same contestors, I found that they weren't heard either. Perhaps, I surmised, the program doesn't "hear" well after a CO Test sequence. As a test, I tried calling "CQ test" and it must be true: No one answered.

This last bit might be construed as sour grapes. Not so. The learning part is that the stations having success had, for the most part, clean signals, and they stood out as though they were running a hundred watts to an efficient antenna. I wasn't doing that. Plus, they very likely had a different bedlam factor for the incoming signals at their station. What is needed at this little whistle stop is a stronger presence if I wish to compete.

Which thoughts bring up a few points about producing a loud signal on PSK31. You will notice that an overdriven signat (audio level too high on transmit) is about two to three times "louder" than the same station is after the audio is adjusted correctly. So, some folks wonder, why not overdrive and be heard?

The reason is simply that the overdriven signal takes up a lot more spectrum than the properly adjusted signal. PSK31 should be 31.25 Hz wide. That's it. An overdriven signal, as you can observe with the display on DigiPan or Logger, may easily be five times that width, and I hear tell of signals worse than that. So the idea is to keep within the parameters intended for the program and you will be copied quite well "down in the mud." You will find that four or even five equally spaced, clean signals can coexist within a space of 200 Hz. You will observe this happening from time to time, believe it

If you would like to have an audio "scope" program to observe signals all by itself, there is an excellent freebie program by Bob K4CY, the author of Logger. The URL for download is the same place as the Logger program (see Table 1).

See Fig. 2 for a sample of the display. The display on your monitor does not cover the entire monitor screen, and has buttons for you to click for various functions. The functions are described in the caption. I noticed complaints that some folks were downloading the scope program and having problems. So I waited a week or two until it had been tweaked a bit, and the program loaded and ran like a charm. Apparently, some computers accepted the configuration and some did not. It is highly unlikely that you will experience a problem with the program by the time this article reaches you.

Speaking of Logger, the updates keep coming. At the time of this writing, the latest version is v7.01. Bob just keeps adding on new features. The latest is to allow a recording and playback to the other station of his signal. At this writing, I have not made the install and tried the new addition.

I have fallen into the clutches of the logging abilities of the program. The PSK31 with the spectral display is great. I enjoy

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Table 1. The infamous chart of everything you ever wanted ...

that part, and probably would not have gotten the program if that wasn't included. Now that I have it up and working and fairly well understand the logging part, I wouldn't want to be without it.

More new stuff. I have mentioned the Hellschreiber and MT63 programs from IZ8BLY earlier and left URLs last month. Finally, I bit the bullet and downloaded the files. What a blast! (Note the URL in **Table 1**.)

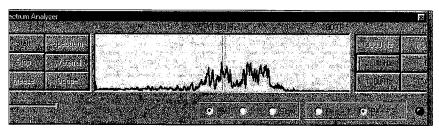


Fig. 2. This is the display you will see with the scope program from Bob Furzer. The signal is frozen in the spectrum mode on an SSTV signal. This leaves only one of the buttons at the left readable. In addition to the start button, there are choices of Spectrum, Waterfall and Scope display. The other two buttons are Freeze and Stop. The program gets its samples from your computer sound card, so you use the same set up as for digital sound card communication programs.

Hellschreiber, as you may know, is a resurrection of an old mode developed by the Germans in the 1920s. It was, I am sure, only used on landline service to transfer hard copy from one station to another. They had portable field units. A picture of one is available on the Web site, where you can learn all about this forerunner of the facsimile mode.

What is fun is running it under Windows95 through your sound card, with the same setup you would use for PSK31. The action seems to be primarily around the 14.063 MHz area. At first I had a bit of a problem with the relatively simple configuration to make the received message readable. Then I discovered the pull-down under "Receive" had a "bias" adjustment. A little tweaking there, and most signals are nearly perfect print.

There are not a lot of hams involved in what is referred to as the "Fuzzy" mode, but anyone doing Hell is having a ball. There are a lot more options in the Windows program than the German designer ever imagined. One big advantage is selective fonts. Angelo W8ERN has it pretty well figured out, so his signals are very readable.

He is using one of the more straightforward fonts in the bold mode and they really stand out when they hit your monitor. The throughput is not exactly in the robust category. You will not have a problem keeping up as you type your messages. I haven't timed the rate, but it is under 10 words per minute. Kind of nice. Lots of time to correct your errors before anyone sees them.

It didn't seem like there was much activity, until one Saturday when I decided to show the wife the strange print on the screen. There was only the slightest hint of a signal out there, so I sent a CQ to show what the fonts looked like on the monitor. There was action. I got a response from Tom KA7W in New Mexico — he was having trouble with copy due to the QRM from signals to the east that I was barely aware of.

We did a few turnarounds and he mentioned switching to MT63. The previous day, Tom had been my second MT63 QSO and I was his first. That may sound like two blind people groping in the dark. However, the software, though it does have a different operating scheme, is quite user-friendly and your first experiences will very likely go as mine did, without hardly a hitch.

The MT63 software does require a fairly fast computer. My 120 MHz Pentium with 32 megs of RAM is adequate, but apparently just barely. Tom was having a problem with a similar setup, maybe a tad slower, in that the tuning display (another

Amateur Radio Via Satellites

Andy MacAllister W5ACM 14714 Knights Way Drive Houston TX 77083-5640

Advanced AO-27 Techniques

Last month, we investigated the basics of making contacts via the FM crossband repeater in the sky, AMRAD-OSCAR-27. OSCAR is an acronym for Orbiting Satellite Carrying Amateur Radio. We showed how to get started with only a typical dual-band handie-talkie and standard whip antennas. This time, we'll take a look at some advanced AO-27 techniques and gear.

There is a growing number of hams who have taken satellite activity away from the home station and literally hit the road with portable stations that they can use at a moment's notice. Their reasons for this effort vary. Some can't put up outside antennas at home due to deed restrictions or other physical constraints. Others have work schedules that preclude being at home, awake, and available for satellite passes.

Either way, putting together and using a portable or mobile hamsat station can be a perfect solution, and it's a challenge.

Those who have made satellite contacts while mobile or portable have learned a great deal in the process. First, they had to find a radio that could do the job. Then an appropriate antenna was needed. Orbital predictions for their location were required. Finally, these enthusiasts had to put it all

together, make a few mistakes, and master the process.

The perfect HT

A common question among satellite newcomers is, "I want to get a new handie-talkie. What are the best HTs for satellite work via AO-27 and Sunsat-OSCAR-35?" Fortunately, there are many HTs that will do the job, but the "best" radios to use for singlechannel FM hamsats like AO-27 and SO-35 have important features that set them apart from the others.

The perfect HT would be easy to use, operational on the satellite bands without modification, capable of full duplex on two meters and 70 cm, have a sensitive receiver, and at least five watts output power. My older Alinco DJ-580T satisfied all the wishlist items except the one about modifications. A wire inside the radio had to be cut in order to operate below 440 MHz.

If you do not already have an HT, consider the above criteria before buying. Some of the more successful and active AO-27 road warriors prefer specific Kenwood and Yaesu HTs. There are others that will do the job.

On the Kenwood side, the TH-D7A is a favorite even though it is a bit cumbersome for typical hamsat voice operation. This expensive dual-bander has a built-in 1200/9600-baud Terminal Node Controller (TNC) and can be used for APRS, in addition to normal packet and voice. The TH-D7A is a truly amazing radio. Most HTs have connections for an external speaker/mike, while this one has additional connections for a GPS receiver and computer serial port. A close second, without the digital capabilities, is the TH-79KSS. It's compact, lightweight, sensitive, has five watts of

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04Apr 15	:12 51-W	33999	04Apr	16:56	30-W	34000	04Apr	18:35	28-W	34001
05Apr 14	:45 89-W	34013	05Apr	16:29	57-W	34014	05Apr	18:08	52-W	34015
06Apr 14	17 51-E	34027	06Apr	16:02	73-E	34028	06Apr	17:41	83-E	34029
07Apr 15	:30 35-W	34042	07Apr	15:34	37-E	34042	07Apr	17:14	43-E	34043
08Apr 15	:03 62-W	34056	08Apr	16:47	37-W	34057				34058
09Apr 14	:35 76-E	34070	09Apr	16:20	72-W	34071	09Apr	17:59	64-W	34072
10Apr 14	08 42-E	34084	10Apr	15:53	59-E	34085	10Apr	17:32	67-E	34086
11Apr 15	21 42-W	34099	11Apr	15:25	30-E	34099	11Apr	17:05	35-E	34100
12Apr 14	:54 74-W	34113	12Apr	16:38	45-W	34114	12Apr	18:17	42-W	34115
13Apr 14	26 63-E	34127	13Apr	16:11	88-W	34128	13Apr	17:50	79-W	34129
14Apr 13	59 35-E	34141	14Apr	15:43	47-E	34142	14Apr	17:23	54-E	34143
15Apr 15	12 51-W	34156	15Apr	16:56	29-W	34157	15Apr	16:56	29-E	34157
16Apr 14	:45 88-W	34170	16Apr	16:29	56-W	34171	16Apr	18:08	51-W	34172
17Apr 14	17 52-E	34184	17Apr	16:02	75-E	34185	17Apr	17:41	84-E	34186
18Apr 15	30 35-W	34199	18Apr	15:35	38-E	34199				34200
19Apr 15	:03 61-W	34213	19Apr	16:47	36-W	34214	19Apr	18:26	34-W	34215
20Apr 14	35 77-E	34227	20Apr	16:20	70-W	34228	20Apr	17:59	63-W	34229
21Apr 14	:08 43-E	34241	21Apr	15:53	60-E	34242				34243
22Apr 15	21 42-W	34256	22Apr	15:26	30-E	34256				34257
23Apr 14	:53 73-W	34270	23Apr	16:38	45-W	34271	23Apr	18:17	41-W	34272
24Apr 14	26 64-E	34284				34285	24Apr	17:50	78-W	34286
25Apr 13	:59 36-E	34298	25Apr	15:44	48-E	34299	25Apr	17:23	55-E	34300
26Apr 15	12 50-W	34313	26Apr	16:56	29-W	34314	26Apr	16:56	29-E	34314
27Apr 14	:44 87-W	34327				34328				34329
28Apr 14	17 53-E	34341	28Apr	16:02	76-E	34342				34343
29Apr 15	29 35-W	34356	29Apr	15:35	38-E	34356				34357
30Apr 15	:02 60-W	34370	30Apr	16:47	36-W	34371	30Apr	18:26	33-W	34372

Table 1. April 2000 tracking data for AO-27.

output power, and has plenty of memories to set up for satellite operation.

The FT-51R/HP from Yaesu is another high-performance HT preferred by many FM-hamsat chasers. It's very easy to use, has all the features needed for full-duplex satellite work, and is reasonably priced.

From Alinco, the DJ-G5TH has seen some good prices from the major amateur radio stores like Ham Radio Outlet and Amateur Electronic Supply. This full-duplex dual-bander has more than five watts out when powered from a 13.8 VDC source. Operation is easy and effective.

The perfect antenna

Build it or buy it. When Arrow Antenna came out with their hand-held, portable, dual-band satellite beam, a lot of antenna builders got out their checkbooks. It's fun to build and experiment with home antennas, but there are other issues that have made the Arrow Antenna number one among serious portable operators.

While a long HT whip antenna like the MFJ-1712 or MFJ-1717 often does well, many of the "pros" travel to remote grid squares to provide contacts for those in pursuit of the VUCC (VHF/UHF Century Club) award from the American Radio Relay League. These folks must have good uplink and downlink capability throughout any satellite passes that come over the horizon. A beam is required.

Early portable work was done with anything that would work, from dipoles and whips to full beam arrays, complete with rotors. The inconvenience meant that only a few hams even tried truly portable hamsat operation.

Single-channel FM satellites and dualband HTs go well together. With the addition of a simple dual-band, beam it gets even better. The Arrow II from Arrow Antenna [http://members.aol.com/arrow146/index.html] in Cheyenne WY, is not cheap, but it has all the features that make it the perfect portable two meter and 70 cm satellite antenna. It's light (only 19 oz.), comes pretuned for the satellite subbands, is easy to put together or break down, packs small, and is available with an optional split boom

and built-in 10-watt duplexer. The elements are made from aluminum arrow shafts. The base model is \$73. With duplexer and split boom, it's up to \$139.

The first time I put together an Arrow II, it took ten minutes. It has seven elements on 70 cm and three on two meters. The boom is in two pieces for compact shipping and packing and the instruction manual provides excellent drawings. The assembly notes are minimal, but quite sufficient: "Attach the elements to the boom as shown above, by screwing the elements together through the holes in the boom. Attach feedlines to the BNC connectors. That's it. The antenna is pretuned and ready to go." After the first time putting the Arrow II together, now it only takes me about three minutes from the bag to on-the-air.

On the air

Last month, I provided a chart of orbits for March. A chart for the best pass of each day in April can be seen in Table 1. The data was made with Silicon

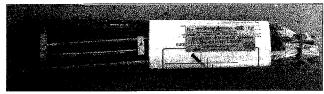


Photo A. The Arrow II antenna with two-piece boom and built-in duplexer.

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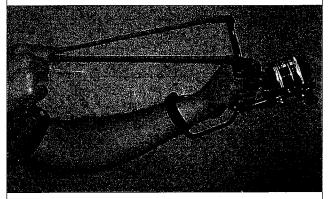




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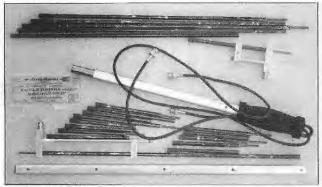


Photo B. The Arrow II has a lot of parts, but they're well made and easy to assemble.

Solutions' [site — http://www.rcallen.com] GrafTrack Rev. 4.01. Pick a location that has a similar longitude to yours. For example, if you live in San Francisco, use the Los Angeles data. On April 1, orbit 33958 will be at the Time of Closest Approach (TCA) at 18:17 UTC or 10:17 PST for Los Angeles. AO-27 will be at 42 degrees elevation to the west. For an observer in San Francisco, this TCA will occur a few minutes earlier.

You can hear the satellite about seven minutes before and after TCA. All orbits are descending. That means that the satellite is traveling from the north to the south. Remember to adjust for Doppler shift. While the downlink is on 436.791 MHz, it will appear as much as 10 kHz high at the beginning of the pass, and 10 kHz low at the end. The AO-27 uplink on 145.850 MHz requires less, if any, correction since the Doppler at two meters is only one-third that at 70 cm.

When using a dual-band beam like the Arrow, a speaker/mike is not necessary, but earphones or earbuds are. It's quite embarrass-

ing to be the originator of feedback via satellite.

The antennas on the satellite are changing their apparent polarization with respect to you during a pass. When using a beam, you should use the data from **Table 1** or your own computer predictions. Simply knowing the direction and elevation to the satellite at one point in time (the Time of Closest Approach or TCA) is enough to use a handheld beam. Since all operational passes are descending, you will know that the satellite is coming out of the north, and then traveling to your east or west, per the chart. After TCA, the satellite will be going south.

It takes some practice to keep up with AO-27 as it streaks from horizon to horizon, but the advantage of a hand-held beam becomes quickly apparent. Not only will you have a stronger downlink, but your uplink on two meters will improve, and you will almost unconsciously compensate for tracking due to the natural pursuit of the best received

signal and subsequent almost automatic maneuvering of the beam antenna.

Check out last month's column for more details on the mechanics of AO-27 chasing. Investigate information from AMSAT, The Radio Amateur Satellite Corporation [http://www.amsat. org]. Try a few passes! I'll have my Arrow II in the car on weekdays in April looking for contacts, but if you don't hear me, there are plenty of regulars waiting



Photo D. Jerry K50E with his Arrow and HT, making AO-27 and SO-35 contacts during a day trip through rare grid squares in South Texas.

to be your first hamsat QSO.

Another challenge

While it's easy to predict operation via AO-27, the same is not true for Sunsat-OS-CAR-35 [http://www.sunsat.ee.sun.ac.za/main.htm]. However, the chase of this more elusive satellite is well worth the effort. SO-35, from South Africa, can be programmed to operate in several VHF/UHF configurations. The favorite has been as a single-channel FM repeater using 70 cm up (436.291 MHz) and two meters down (145.825 MHz). This is the opposite of AO-27.

The strength of the two-meter downlink is spectacular. I have heard this satellite with my HT while the Arrow II was on the ground, aimed in the wrong direction. My inexpensive desktop scanner, with only the built-in whip antenna, also does a nice job receiving SO-35. See if you can figure out the uplink and downlink Doppler effect for this frequency configuration.

The satellite is normally only active on ham frequencies over the U.S. for a few passes per weekend. The best way to keep up with the operating schedule, and to get up-to-date satellite information, is to check the Sunsat Web page shown above. Schedule changes to accommodate onboard experiments are common.

Next time, we'll look at the beginning of your home Earth station for satellite chasing, and other new and exciting repeaters in the sky.

Photo C. After only a few minutes, the bag of parts turns into a very effective hamsat antenna.

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The Voice of DXers

To those who have been thinking about offering material to be published here in this column, I say, "What are you waiting for?" I am eager to receive text, art, and photos from around the world of DX. Don't be bashful, especially if you are reporting on DXpedition activities, or anecdotes and human interest features that pertain to our hobby. All nutritional success testimonies should go directly to Wayne, however.

If you have material of a timely nature, L such as announcements of upcoming contests or DXpeditions, you should be aware that the typical production cycle for this magazine has a built-in time delay of a few months. For example, if you were to submit material in the first week of April, my deadline for the inclusion of that material will be April 15th. Assuming I have submitted the draft of my column to 73 on time, it won't appear in print until the July issue. That works out to roughly a three-month gestation period for the columns and features that appear in the magazine.

I should mention that if you have items of a more immediate nature, you should send them to someone like Bernie W3UR, who publishes the Daily DX on the Internet, or to one of the DX bulletin services like that of the ARRL. If you have access to the Internet, you can send information to Bernie at: [bernie@dailydx.com]. I can say with confidence that between the two of us there is no consideration of competition when it comes to the necessity of getting timely information out to all of you.

Hospitality — Seattle-style

In late January, the hams of Seattle WA, were called upon to meet an urgent diplomatic need. Ms. Deborah Kuznitz, Director of Special Programs for Global Education Services, became aware that a foreign dignitary from an Eastern European nation was attending an economic conference here in Seattle (not WTO, thank God!), and wanted to meet with local hams. Hams?! As it turns out, the dignitary was the Honorable Nikolai Entchev LZ1FL, Mayor of Karlovo, Bulgaria.

To make a long story short, former ARRL Northwest Division Director Mary Lewis W7QGP learned of this situation, and mobilized the social arm of the Western Washington DX Club. She and her husband, Harry W7JWJ (ARRL Western Washington Section Manager), Dick K7BTW, and others got the word out to the general ham community, and pulled together a nice reception at a local Seattle restaurant just prior to Nick's departure.

His Honor shared some interesting stories concerning DX and contesting in his hometown at the gathering. As it turns out, the USA is not the only place where TVI is a problem. One of the ways they get around it in Bulgaria is to have a big-gun club station away from town (in this case, LZ7G), where

they can "turn up the volume," and rack up some impressive scores. See Photo A.

WWDXC members Mike Hansow KA7CSE and Mike Dinkelman N7WA, who also represent the Seattle area's Mike & Key Club (K7LED), were on hand to give Nick something to take back with him. As it turns out, humor found its way onto the agenda. Mike N7WA recalls that, "As a representative of the Mike & Key ARC, I presented him with a T-shirt and member pin from the club. I did err on the side of caution and got him an extra-large shirt, which probably comes down to his knees." From the look on everyone's face (see photo) it looks like a good time was had by all. I wish I hadn't been elsewhere and missed it.

Congratulations to all who participated in making Nick's visit a memorable one. By the way, I just want to know one thing: Did he also go home with a generous portion of Portlock Salmon under his arm?

And now the news

To start with, here are a couple of items

Continued on page 54

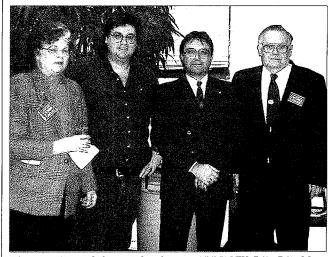


Photo A. From left to right: former ARRL NW Div. Dir. Mary Lewis W7QGP, Mike Dinkelman N7WA, The Hon. Mayor Nikolaj Entchev LZ1FL, and ARRL WWA SM Harry Lewis W7JWJ (N7WA photo).



Photo B. The CWJF Award is issued by the "Juiz de Fora CW Group" of Brazil.

THE DX FORUM

continued from page 53

courtesy of the New Jersey DX Association DX reflector on the Internet.

From Mark DL9RCF, "Dear friends, just a very short information. 4U1UN via: United Nations Amateur Radio Station, P.O. BOX 3873, New York NY 10017, USA, seems to work ... got my card within only a few days ... good DX to everyone."

From Dieter XE1D, "Hi to all. Anybody who did not receive his QSL card from XF4MX, pls contact the following E-mail address for a fast reply: [llibin@tecemp. mor.itesm.mx], or [7233377@mcimail. coml."

At the time of writing, the highly successful XZØA DXpedition had just concluded. Just in case you are interested in some of the statistics, or would like to search the log to see if you are there, point your browser to the following URLs: [www.getnet.com/ ~k7wx/xz0alog.htm], or [www.getnet.com/ ~k7wx/myanmar.htm].

And from Bernie at The Daily DX comes a brief summary of some notable DX stations that will be active in the month of April: 9U5D (via SMØBFJ), VP6BR (via OH2BR), VKØMM, XW2A.

From the Redmond Top Key Contest Club comes a note written by Atsushi JR1NKN/ W7:

"Dear topbanders,

JA's government has announced that 1810-1825 kHz would be added to JA's 160m band, starting April 1st. Your strategy might be changed."

Stay tuned for further details on this story. If you are interested in a list of top-band allocations around the globe, check out the list put together by KØCKD at [www. topband. net/topban2000.txt].

Tito LU7EE, who is one of our friends in the Grupo Argentino de Radiotelegrafia (GACW; loosely translated: Argentine CW Group), informs us of a couple of nice awards that may be obtained by working members of the Juiz de Fora CW Group in Brazil. I understand that they are nice awards (see Photo B), and are recommended to all those who desire to promote CW in the "post license deflation era" ushered in by the FCC. Here are the details:

CWJF Award

Issued by "Juiz de Fora CW Group" to all amateurs who have worked three different CWJF members. Contacts are valid on any band after May 1, 1985. Only two-way CW mode. Do not send QSL cards, only GRC. Fee: 6 IRCs. The award is also available to SWLs under the same conditions.

any suffix letters from the phrase JUIZ DE FORA — A MANCHESTER MINEIRA.

b) Three different CWJF members.

Contacts can be in any band, only twoway CW mode, after May 1, 1985. Do not send QSL cards, only GCR. Fee: 6 IRCs. Applications and requests for further information may be addressed to CWJF: P.O. Box 410, 36001-970 Juiz de Fora — MG, Brazil.

For the benefit of those of you who do not have access to the Internet, here is a list of Juiz de Fora stations (as of Oct., '99): PY4CEL (Treas.), PY4CY, PY4EM (Secretary), PY4HJ, PY4KL, PY4VB (Vice Pres.), PY4VG, PY4WAS (Pres.), PY4WQN, PY4YN.

For a comprehensive list of CWJF Members, point your browser to: [www.powerline.com.br/cwjf].

Just listening — an emphasis on the joy of SWLing

I don't have much to report in the SWL arena this month, so stay tuned, HI. Some folks asked me what happened to my monthly radio program on HCJB. (See Photo C.) Well, to make a long story short, I agonized over the future value of my efforts with HCJB, and concluded that I needed to consolidate some of my activities, and make better economy of my time. Hence, I pulled the plug on "Tech Talk with Dr. Rick" with the intention of devoting more time and effort in support of 73 Magazine.

Back when Allen Graham and I were first trying to come up with a name for

ave and more linked to you

Together on the same wavelength

Continued on page 60

DCJF Award

Issued by "Juiz de Fora CW Group." The award is available to all licensed amateurs and SWLs who have confirmed contacts with:

(a) South American stations using

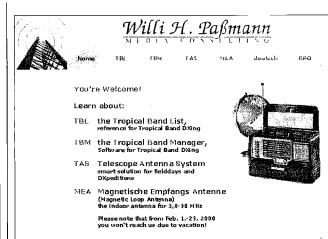




Photo C. I pulled the plug on "Tech Talk with Dr. Rick" with the intention of devoting more time and effort to support of 73 Magazine. | **Photo D.** You're invited to check out Willi Passmann's Web page.

Mobile, Portable and Emergency Operation

Steve Nowak KE8YN/4 1011 Peacock Ave. NE Palm Bay FL 32907-1371 [ke8yn@netzero.net]

Installing Your Mobile Rig

Are you new to the hobby and nervous about installing a two meter rig? Maybe you are an experienced ham who hasn't yet taken the plunge into mobile HF operations. Put away your worry beads and break out the toolbox, because installing a mobile rig is a lot easier than you may think. There are really only three components with which you must be concerned. There's the radio itself, the power source, and the antenna. That's it! So with that frame of mind, let's take a look at how to install a mobile rig.

Perhaps you've just picked out your dream radio, or maybe you've come back from a hamfest with a more experienced radio that will meet all your hamming needs. In either case, the first step is to pick an appropriate location in which to install it. For most of us, this will be a fairly easy decision, since we will want a location in which the radio will fit and will be conveniently located for the driver of the vehicle.

The first decision we need to make is whether the radio is going to be a permanent or a temporary installation. A temporary installation makes it convenient to move the radio so that it can be used elsewhere, or stored in the trunk when the car is parked to minimize the chance of theft. It's a good idea to check your insurance policy before installing the radio. Some policies will only cover the radio if it is permanently mounted in the vehicle, while other policies will not cover ham equipment,

so it is a safer bet to lock the radio in the trunk.

A proper installation should not present a threat to the occupants of the car in the event of an accident. Anything inside the car that is not anchored has the risk of breaking free and becoming a missile that can travel through the interior of the car at a high rate of speed. A proper mount ensures that the radio will stay put even in the event of a collision or sudden stop. Naturally, you should also make sure that the location is such that people inside the car do not collide with the radio. A radio mounted at knee level immediately in front of the driver can have serious consequences in the event of a sudden stop. Both permanent and temporary mounts can and should keep the radio secure.

Ensure that the radio is easy to operate without distracting the driver from his or her primary responsibility of controlling the

car. The display should be easily readable from the driver's position. It is important to check not only for visibility of the display but also to avoid glare that might interfere with the display. With VHF and UHF operations, there is not a lot of tuning required, so front panel access is sporadic and brief. For low band operation, more tuning is required, as well as access to other features. so the location of the main controls will be more critical. If a lot of control manipulation is expected, the rig should be located so that the hand can rest on the seat or armrest and reach the controls without holding the arm extended. This will eliminate unnecessary fatigue.

The two most common locations for permanently mounting a radio in an automobile without a center console are under the dashboard or on the floor. Under-dash mounting works best for smaller-size rigs such as VHF radios, and provides a location



Photo A. Taller mobile antennas should be mounted on the driver's side to better clear tree limbs hanging over the road.

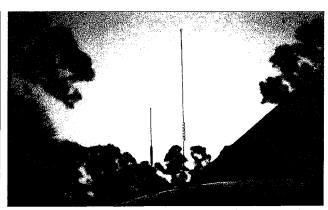


Photo B. On-glass mount antennas have benefited from technology developed by the cellular telephone industry, and work well for VHF and UHF applications.

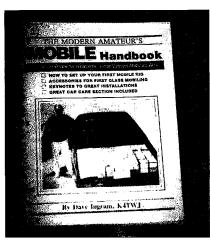


Photo C. There are many good books on mobile operations, such as this one from MFJ Enterprises.

that is both attractive and convenient. For pickup trucks and some suburban utility vehicles, there may be ample space; however, in many cars space is limited and so may be your options. If you wish to mount your rig under the dash and it appears that there is not enough space, you may be able to clear up enough room by removing the ashtray. This can give the rig more of an integrated appearance. Likewise, some cars have a shelf below the broadcast band radio that may provide a suitable mounting location.

In-dash or under-dash locations are convenient, but may present a few mechanical problems. Modern vehicles use plastics extensively, so the old method of mounting a radio to the bottom of the dashboard with a couple of sheet metal screws may not work. What will work in many cases is to install large washers or a piece of sheet metal both above and below the mounting surface. Generally, it is easiest to install the radio's

mounting bracket under the dash first, and then to mount the radio into the bracket.

If the dashboard is plastic, it will not provide a ground for the radio. This means that the ground to the radio will be provided through the negative power lead and/or the outer braid of the antenna coax, which is not optimal. If your radio requires a proper electrical ground, you'll need to install a connection from the radio to a good ground in the vehicle. For most VHF or UHF radios this is not required, but check your radio's manual to determine what the grounding requirements are.

A floor mount is practical when a larger radio is to be installed — particularly a high frequency radio. The dashboard may not provide sufficient strength to support a heavy radio, and a floor mount does provide for a more comfortable position for the arm while tuning. In addition, if several radios are going to be installed, they can be stacked on top of one another without sacrificing stability. There are mounts available with multiple shelves so that several radios can be mounted with each in its own space.

On the other hand, there are angle brackets available at many radio stores that allow a single radio to straddle the hump on the center of the floor. While these can be used for a nonpermanent mount, I prefer to anchor the brackets to the floor with sheet metal screws. If possible, check to make sure that there are no wires running under the carpet in the location you have chosen before drilling holes. Don't be surprised if it takes a 3-inch sheet metal screw to ensure a good, firm grip, because it is easy to have quite an angle between the bracket and the floor.

Of course, radios can be installed in a temporary fashion. The hump mount brackets mentioned above are one possibility, but there are a number of others. I have seen

> radios mounted on a bean bag mount which readily will conform to the floor hump and provide a stable location during normal driving. Both these methods generally imitate a standard floor mounting of the radio. While it may seem that an underdash location does not lend itself to a temporary arrangement, some mounting brackets have

hardware that can be removed without tools. The radio can be mounted to the bracket with knurled knobs or wing bolts that can be removed relatively easily.

There are also brackets that allow the radio to be slid in and out of its location. These may include electrical connections that automatically connect the radio to power and the antenna when the radio is slid into its location. Personally, I prefer a more robust antenna connection, especially for 6 meters and lower. Since most radios only require a power and antenna connection, I prefer to connect and disconnect these directly rather than through a mount.

Another interesting method of mounting a radio is to use bungee cords. In this way a radio can be mounted vertically against the front of the seat so that the display is facing up. In some cases, such as when there is a center console, this is an ideal location. It may be necessary to devise some type of spacer to keep the heatsink on the back of the radio clear and prevent kinking of the cables. Make sure that the cords are tight enough to keep the radio secure. For smaller radios, heavy-duty Velcro fasteners can be used, particularly for mounting to a vertical surface. The most secure version of this had Velcro between the radio and the surface, and Velcro straps over the top.

Power

The power connection for the mobile radio is fairly straightforward. Most mobile rigs come packaged with power cords that have an adequate current rating. Since the manufacturer knows the rig's requirements, this is usually the easiest approach. If you are running your own power cable, make sure that the cable is able to handle the required current. Too small a wire can lead to poor performance at best and a fire hazard at the worst. If you have a long run, it is often more practical to run two wires in parallel for the positive and two in parallel for the negative rather than a single larger gauge wire. Obviously, the shorter the power cable, the smaller the gauge required.

It's tempting to connect the radio to the fuse block or the cigarette lighter. Although this may work for a low output rig, many radios put out 25 to 100 watts. The best course of action is to connect the radio power cable directly to the battery. If you are one of those people who forget to power off the radio when leaving the car, the radio can be made to switch off with the ignition. The best and safest way to do this is to use a relay (see Fig. 2). The other big argument that hams love to have is whether to put a fuse in both the positive and negative leads,

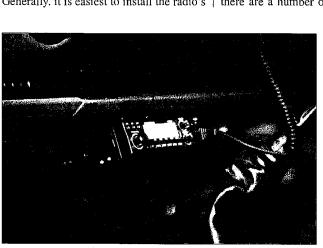


Photo D. Your final installation should be easy to reach and see.

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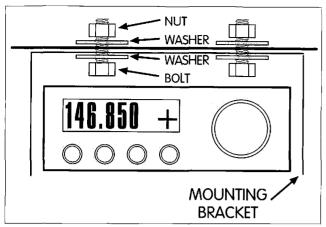


Fig. 1. Using large washers or a piece of sheet metal to distribute the weight of the radio can make it possible to mount a small radio to the underside of a plastic dashboard.

or only in the positive one. The best advice I've seen is to fuse both wires near the battery.

Antenna

There are many choices for antennas, and with as significant a difference as antennas can make, it is a choice worthy of careful thought. Magnetic-mount antennas are easy to install, but they tend to provide marginal operation. The base of the magnet provides a capacitance coupling to the car body that acts as the counterpoise for the antenna. While a magnet mount is great for use on rental cars while traveling, and better than a rubber ducky antenna inside the car, it is not the optimal antenna for mobile operations. Many cars have so much plastic and aluminum that you may have difficulty even finding a spot where the magnet will stick.

On-glass antennas are popular, reasonably priced, and easy to install. In most cases they will only be suitable for VHF frequencies or higher, although I have seen one which could be used for ten meters. These

antennas use a capacitive coupling to connect the antenna on the outside of the glass with the mounting block on the inside of the glass. The glass itself acts as the dielectric between the conductors.

A few years ago, many of these antennas had problems because auto manufacturers had begun to use metal-based tinting in the windows. This prevented a proper

coupling. During the early to mid-1990s, the cellular industry worked out many of these problems, and the on-glass antennas available today seem to work very well. Read the manufacturer's recommendation for temperature range, etc., before beginning, and plan on letting the car sit for an hour or so before heading out at highway speeds.

When installing an on-glass antenna, I recommend assembling the antenna and placing it in position using duct tape. It's easiest to mount the inside block first, usually near the top center of the rear window. After it is secure, mount the exterior portion of the antenna with duct tape as well. Make sure that the antenna is as close to vertical as possible, and then check the SWR. If you are able to adjust the SWR to an acceptable range, then it's safe to mount the antenna permanently.

Remove the external section and mark the window with an alcohol-based "permanent" felt tip marker. Then remove the internal portion and clean the window with isopropyl (rubbing) alcohol. Don't use window cleaner, as this contains silicone that will

prevent the adhesive from sticking. Use the markings to line up the internal mounting block. Be as careful and precise as you can once you press the block into place, you won't be able to move it. Next, clean the exterior of the window with alcohol and line up the external block (with the antenna pointed up, of course). Snake the cable under the headliner, and then to the radio location. Cable can be readily concealed under the carpet, along the molding of car doors and under seats.

While a ball-mount antenna is the most durable of antenna installations, many people are not anxious to drill multiple holes into a new car. For this reason, a number of mounts have been developed that do not require major surgery on the car body. Trunk lip mounts are a favorite, and there are a number of outstanding examples that use an SO-239 fitting to mate with a PL-259 antenna. While there are many 2 meter and 440 MHz antennas available with PL-259 fittings, there are also a fair number of HF antennas configured the same way.

For HF, there are also many antennas that have a 3/8" threaded fitting on the end. These tend to include those antennas that are longer or have a higher wind resistance. Three-eighths-inch mounts include the ball mounts that can be mounted through the fender, through the trunk mounts and various mounts that can be attached to the underbody of the automobile, bumpers, or trailer hitches. The advantage is that with these mounts you can often get more antenna onto the car, although it will often be mounted lower.

Since the antenna uses the car body for its counterpoise, some effectiveness may be lost with a bumper or other low mount, but the overall performance of a larger antenna should still be worth the effort. Don't forget that any of the connections exposed to the elements should be sealed with moldable coax seal or a silicone rubber sealant.

Whatever type of antenna you use, especially for high frequencies, there are a few realities with modern automobiles that need to be considered. First, as mentioned earlier, modern automobiles have more plastic and less steel. Second, the parts of an automobile are painted prior to assembly, so although the pieces may fit together well mechanically, often the individual pieces are electrically insulated from one another. Third, when cars were built on a frame, the frame acted as a single buss to which everything was electrically connected. Most of today's cars are no longer assembled on a frame, so the panels are not connected to a common point. Each of these factors will decrease the effectiveness of the car body as a ground plane or counterpoise and may add noise to the received signal.

Because of this, it is often necessary and almost always advisable to ensure that the various panels of the car are properly connected. I find that the braid from RG-8U

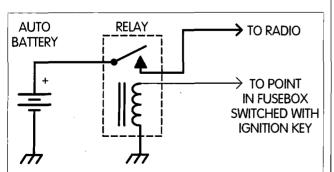


Fig. 2. A relay can be used to switch off a mobile radio whenever the ignition is turned off. Make sure you use a relay that can handle the current required by your radio.

coax makes an inexpensive yet effective connecting strap. I'll remove the braid from a used piece of coax, making sure that it is not corroded, flatten it and cut to length. I'll then use an ice pick or awl to spread the coax and make a hole for the mounting screw. I'll heat the end with a large soldering gun or propane torch and then tin the ends with a good quality solder. After it cools, each end can be connected with a sheet metal screw and washer. Common places that need to be bonded in this way are the trunk lid and hood to the main car body.

So how did your installation go? Drop me a line with your experiences. Next month, we'll be talking about some accessories and other gadgets that make operating easier and more fun. 'Til then, 73!

Morse Code — The Once and Future Mode

continued from page 14

The more you do it, the better you get, but you never quite reach perfection.

There are many, many techniques for learning Morse code and for increasing proficiency. The unsaid secret is that almost *any* of them will work if you give them a chance. The only way to really learn Morse code is to use it. You are teaching your brain to understand what it is hearing, and teaching your hand to send what you are thinking. Skills are developed through use, and there are no shortcuts.

As amateurs, we do often have unrealistic expectations about learning Morse code. There are few if any professional Morse operators left in the world, although there are lot of hams who used to be pros. A professional is someone who makes his living from sending and receiving code, eight hours a day or more, day in and day out. It's their job.

Amateurs have limited time available, and so it takes a good bit longer to reach anything resembling "mastery" of Morse code, but it will happen if you keep at it. At some point, whether you are giving a "first QSO" to a Novice at 5 wpm or rag-chewing with a friend at 20 wpm, it will suddenly dawn on you that you are not copying what is being sent, you are hearing what is being said.

That's the point at which you will have discovered the real joy of Morse code, and become a member of the international and eternal brotherhood of brasspounders. Not because you have to, and not because it is fun, but simply because you can.

Looking forward

From time to time, I hear speculation that we could face a natural disaster that wipes out most of what we call "technology," or perhaps a war with an enemy who has figured out how to use their technology to defeat ours. These scenarios are often dredged up in an attempt to justify preserving Morse code, which is seen as being under threat and in need of defense.

In the first place, if there were a sudden need for thousands of Morse operators, they could be trained very quickly — possibly more quickly than communication networks could be created for them to use. We went through that in World War II.

In the second place, Morse code will survive as long as people want to use it, and there is absolutely no question that it is the mode of choice for an increasing number of hams. There are many "sub-hobbies" within amateur radio, but the one area that has seen spectacular and sustained growth over the last few years is QRP (low power operation). Because of the power advantage (equivalent readability on the order of 18 dB greater than SSB), CW is used in the majority of QRP operations. QRP is inexpensive, it's environmentally friendly, it's challenging, and it's fun. CW is the mode that makes it possible, and you don't hear any complaints about Morse being "too hard." But don't take my word for it - listen around 7.040 almost any evening.

Diehard DXers know that CW will get through when SSB just won't cut it, and the same is true of the top contesters. Anybody who thinks CW is dying out should listen to the CW subbands during Field Day.

As the owner of a company that deals in Morse-related products, I'm in a position to know that interest in Morse code (and the machines that make it useful) has been growing steadily

over the last four or five years. I'm also an active operator, so I know that use of CW on the air is also increasing. Maybe it's not "high tech." Or maybe, since it is direct digital input to the brain, it's as high as tech can get.

Either way, it's fun, it's rewarding, and it's going to be around a lot longer than I am.

Make Copies of This Article

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sent to you — just learn the sounds. For example, when you hear di-dah, just write the letter A. Practice, practice, and practice is the way to learn the code and to increase your speed.

Give it a try. You may find that you really enjoy it and may even want to become a radio amateur. Have fun!

For information about amateur radio, contact the Amateur Radio Relay League, 225 Main St., Newington CT 06110, tel. (860) 594-0301, [www.arrl.org]; or The W5YI Group, Inc., P.O. Box 565101, Dallas TX 75356.

Companies that sell code practice kits include MFJ Enterprises, P.O. Box 494, Miss. State MS 39762, tel. (601) 323-6551, [www.mfjenter prises.com]; Electronic Rainbow, 6227 Coffman Rd., Indianapolis 46268, tel. (317) 291-7262; and Jade Products, P.O. Box 368, East Hampstead NH 03826-0368; tel. (800) 523-3776.

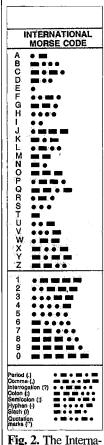


Fig. 2. The International Code — for radio communication. (Courtesy of ARRL Operating Manual, 4th ed., 2nd printing 1993; pp 17–25.)

OK, so what's the speed of dark?

More on Embedded TICKS continued from page 22

ways to keep me out of the shack and not reinforce my addiction to ham radio.

The kit went together easily and without any problems. It powered up right away and let me know it was feeling OK by emitting a "dit-dit." The TICK-2 emits a "dit-dit-dit."

There are supplemental instructions telling how to run the TICK using less power consumption. Using less battery power is a kind of religious thing for many QRPers.

The TICK-1 keyer is easy to use. All functions are accessible through the single button interface. After the keyer starts up and dits at you, you can select its other functions by holding down the push-button and then using the paddles for some input. The keyer chip gives audio output to tell what function you have reached by sending the first letter of the function in Morse code. By holding down the button, you cycle through the functions. **Table 1** explains the TICK-1 functions.

Embedded Research also has released other keyers in either chip or kit format. I have summarized their features in **Table 2**. The pinouts on all the TICK chips are the same, so upgrading from one set of features to any other level is very easy. All you have to do is purchase the new chip, pop out the old, and replace it with the new.

The Finger

continued from page 25

moment, visualizing an old man in a wheel chair waiting and wondering and wishing. I needn't have. A wavering signal came on calling him and signing a W5 call.

"Behold the triumph of the finger, Hunky Hollowers," I said. "You ready for that beer?"

QRP

continued from page 45

and key. Hook up the dummy load to the antenna jack and apply power, watching that all-important polarity, and key down. You

should see at least one watt of RF into the dummy load.

To adjust the receiver section, tweak the antenna trimmer cap, and that's all there is!

How does it work?

The first thing you have to understand is that the Vectronics is a very simple transceiver made up of time-tested circuits. It's unfair to compare this rig with a \$1500 transceiver. Now. having said that, the Vectronics operates as you would expect.

The receiver is quite sensitive. You can easily hear stations that are quite weak. And, that's a problem. With only one tuned circuit in the front end, the receiver is easily overloaded. The front-end "brute force" RF gain control does help, but does not eliminate the problem.

With one watt, you can easily work plenty of stations on 40 meters. The VXO gave me about 7 kHz worth of operation. Keying is crisp and clean with no chirps or tweets.

I was glad to see Vectronics use a 2N3055 in the final instead of the 2N3836. The 3055 is much tamer and is robust enough to withstand a mismatch antenna for a few minutes.

Some loose ends for the Vectronics transceiver

I did not get the VEC1300KC enclosure. It would be in your best interest to get this case along with your transceiver. There are enough holes to drill to make the matching enclosure a good value.

The Vectronics transceiver does not support semibreak-in or QSK switching. You must manually change from receive mode to transmit mode by pushing in a switch. I found that most time-consuming.

There's no sidetone, either. Although Vectronics allows you to key an external piezo sounder. I used a separate receiver tuned to the output of the rig. With the RF gain down and no antenna, the receiver provided me with a sidetone.

The use of a resonant antenna would help eliminate the receiver problems. Also, a handful of parts could be added to the audio chain before the LM386 to help tighten up the bandwidth of the receiver.

The Vectronics would be a great base to which to add on lots of home-brew goodies. Anyone for a digital readout?

All and all, the bottom line is the Vectronics is a great place to start QRPing. It's an easy kit to build and will provide lots of QSOs. The rig is simple enough for anyone to build, and it would be a great tool for the class.

Vaya Con (Ra)Dios

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Outside the town of Sant Marti Sarroca, 30 miles from Barcelona, lives Pere EA3AJI (Photo N). A computer programmer, he started in amateur radio in 1991. His location is about 1100 feet above sea level, and his tower is 64 feet high. Pere's antennas are: a Hy-Gain TH-11DX with 11 elements for 10-12-15-17-20 meters, a rotatable rigid dipole for 40 meters, and an inverted V for 80 meters. He has an IC-775DSP and the Ulvin Tremendus III 5 kW amplifier (2.5 kW pep), as well as an IC-R7100 receiver and a TM-V7 for 2 meters and 70 cm. Pere works SSB, CW, and some RTTY. His E-mail is [ea3aji@ctv.es]. He is a DXer with 315 entities, has OSL cards, and also has worked EA0JC, second operator Jose. His father-in-law Antonio is EA3CLO.

In Sant Pere de Ribes is Miquel EA3NB (Photo O), an electronics engineer licensed in 1979. He works for Roca, where he designs electronic devices for sophisticated bathroom fixtures such as shower cabinets with radio, telephone, control of water flow and temperature, etc.

On his 38-foot-high roof, Miquel has a 35-foot tower with a TA-33 3-element yagi for 10-15-20 meters, a rotatable Cushcraft D-40 rigid dipole for 40 meters, and an inverted V for 80 meters. He is a DXer with 312 entities, and works on SSB, CW, and RTTY. He uses his computer for logging with DX4WIN, has DX cluster, and is on the Internet. He has QSL cards and his E-mail is [ea3nb@redestb.es].

The entire trip lasted 22 days, and I met amateurs in Catalonia, the island of Mallorca, Madrid, Valencia, and Andorra. Each group will be described in a separate travelogue. I admit that I like the Spanish people, their personalities and ways of life.

I especially admire their mentality. They have very sound advice that unfortunately I could not follow, but my son Thomas KB2KRN is already an expert:

"Live off your parents, until you can live off your children!"

THE DIGITHL PORT

continued from page 48

waterfall as in PSK31) could not be used because it would bring the other functions of the program to a grinding halt. So he was still able to use MT63 effectively because the other stations could do the fine tuning. Darn near as user-friendly as it gets.

Both the Hellschreiber and the MT63 programs use a waterfall display for tuning, but they are not quite the same as their counterparts in PSK31. They are wider and they go sideways, from right to left. The MT63 displayed signal is very wide on the screen. I was trying to think of a comparison of water that goes sideways. I could only think of a fire hose and that isn't correct. You expect to see water from a hose in an arc. Of course, since this only a short distance on the display, maybe it is just a matter of relativity. You will have to download it and decide for yourself. It is fun, however you see it.

One last adventure. I have been working at getting the Icom 735 to speak a bit more fluently to the computer. That is, to record mode and settings for logging purposes just like the modern rigs are supposed to do. It turns out to be more involved than just plugging in an interface.

I have learned a lot thus far. When I started looking into this, I thought there would be a lot of individual signals ported through one of the accessory ports. Well, surprise me, all the available data comes out of a simple monaural plug (one wire with a shield) and, next surprise, available control is accomplished via the same single cable.

I have an interface working and am in the midst of exploring various software available. I have one other Icom-specific piece of software to get up and running, and then I have instructions on how to increase the agonizingly slow 1200 baud rate of the radio so that it will talk to the Logger program. Results to come. Most people would simply buy a newer, more computer-friendly radio, but this is fun. (Most of the way.)

If you have questions or comments about this column, E-mail me at [jheller@sierra.net]. I will gladly share what I know, or find a resource for you. For now, 73, Jack KB7NO.

THE DX FORUM

continued from page 54

the segment which appeared on his "DX Partyline" program, I chose the generic title of "Tech Talk" in the hope that one day someone else would be able to step in and

keep the program going. He was the one who added the tag "with Dr. Rick."

Hopefully, we will hear "Tech Talk with (somebody else)" on his program very soon. It was great fun producing those segments, and I already lament having made the decision to step away. Thanks to all who listened, and especially to those who took the time to send along their comments and good wishes.

A tool for tropical band DXers

Last month, I received a very nice note from Willi Passman, who, for the past ten years, has been an editor for the *ADDX Kurier*, a German SWL magazine for the 4500 members of the ADDX organization. He invited me to check out his Web page that describes the services he provides to the SWL community. I was quite impressed with what he has done, and invite you to check it out for yourselves at [www.radioportal.org]. (See **Photo D**.)

Vox populi — the voice of the people!

Boy, that sounds funny coming from a dyed-in-the-wool Goldwater Republican like me (just kidding), but, nevertheless, that is the main idea of this column: a personal focus on the pursuit of DX. If all goes as planned, this feature will be added to the DX Forum, starting with the May issue. This will be a segment that will allow folks like yourselves to share your personal feelings and express your own opinions about what is going on in the world of DX.

I also plan to include some survey questions and results. To kick the three-month editorial flywheel into motion, I will salt the Internet this month with some questions. Once we get rolling, I expect that the fodder of current events will cause material to flow in to my E-mail and snail-mail boxes directly.

There are rules. There always have to be rules, right? Well, in this case, yes. For this to be a credible forum, I must require that your feelings and expressions be communicated in a civil manner. You will be much more successful in getting your point across if you take the time to think your comments through, and present a cogent argument. I will not publish commentary that is riddled with incendiary invective and misanthropic persiflage. Oh, I'll be glad to read it if you send it along, but the power of the editor's pen will hold sway, I gah-run-tee!

Pulling the big switch

So much for this month's offering. I look forward to hearing from all of you very soon, so 73 and good DX!!

ORX

continued from page 6

To register for the ULS, visit [http://www.fcc.gov/wtb/uls] and click on "TIN/Call Sign Registration." Paper registration also is possible. For more information, call tollfree (888) CALL-FCC (225-5322).

Thanks to the ARRL, via The Repeater (Warrensburg [MO] Area ARC, Inc.), Katie Pautz WØKTE, compiler.

US Navy Abandons Radioman Rating

First, the United States military decided it no longer needed to use the Morse code. Now, the Navy is doing away with the last vestige of its ties to traditional terrestrial two-way communications. This, as it announced last fall that it is abandoning the rank of Radioman.

The Navy said that the rating of Radioman would be changed to Information Systems Technician, effective immediately. The announcement said that the Navy made the change because doing so is consistent with ongoing efforts to properly man and train its personnel to handle the changing environment of the Information Age.

But the Navy has made one concession to the past. It says that in keeping with the tradition of the Radioman rating, the rating badge showing electronic sparks will be retained for the new Information Systems Technician.

Thanks to Hudson Loop and TWIAR, via Newsline, Bill Pasternak WA6ITF, editor.

Marconi Artifacts Discovered

Has one of Marconi's early antennas been found in his hometown? According to newspaper reports out of Milan, someone may have discovered pieces of an antenna wire hidden in the branches of a large tree in the park of the house where the young Guglielmo Marconi lived and carried out his experiments at the end of the 19th century. According to the story, the searchers also found a metal plate that may have been used by Marconi as a ground.

This story was first reported in ham radio circles by Giosalberto Lazzara IK2AIT, and then published in an ARRL Letter. Further news reports say that other artifacts of Marconi's youth have also now have been found.

Thanks to the ARRL, via Newsline, I Pasternak WA6ITF, editor.

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A Good Month, No Foolin'!

Seasonal effects: April is expected to be a good month for HF propagation, with very few anticipated ionospheric upsets.

As you can see from the calendar, the first nine or ten days of the month should be unusually good with the near peak of Sunspot Cycle 23 combining with seasonably favorable conditions. We don't anticipate Poor or Very Poor conditions this month, but you can expect days of Fair or trending conditions as shown on the calendar.

For those who enjoy "keeping an eye on the sky," look for a close grouping of Jupiter, Mars, and Saturn in the west after sunset during the evenings of April 5–15, with the crescent Moon next to Saturn on the 6th. Just before sunrise on April 28th, Venus and Mercury will appear less than a half-degree apart, but could be masked by the glare of the rising Sun.

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HAWAII	10/12	12/15	17/20	17/20		20/30	17/20	17/20	10/12	13/17	13/1/	10/12
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AUSTRALIA	10/12	15/17	15/17		17/20	20/30	30/40	17/20			12/15	10/12
CENTRAL AM.	15/17	15/17	17/20	17/20	20/30			10/12	15/17	10/12	10/12	10/12
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April 2000							
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16 G	17 G-F	18 F-P	19 P-F	20 F-G	21 G	22 G-F	
23 F-P	24 P-F	25 G	26 G	27 G	28 G	29 G	
30 G							

General band-by-band forecast:

10 and 12 meters

Fairly regular DX may be expected on Good (G) days to Europe and the East before noon, and to Africa shortly after noon. Also, you may find good band openings to South America, the Pacific, and the southhemisphere during the afternoon. Short skip between 1,000 and 2,000 miles during the day is anticipated for most days.

15 and 17 meters

You can look for excellent daytime DX to the southern hemisphere and to

10/12 12/15 12/15 15/17 17/20

most areas of the world, peaking to Europe before noon and to most other areas of the world during the afternoon; daytime short skip beyond 1,000 miles will be frequent.

20 meters

Excellent DX openings to most areas of the world are expected on Good (G) days from local sunrise until long after sunset. Peak conditions should occur an hour or two after sunrise and again in the late afternoon. On Good (G) days, DX into the southern hemisphere can be worked during the hours of darkness as well. Short skip from 500 to over 2,000 miles is anticipated on most days.

30 and 40 meters

These may be your best DX bands from local sunset until sunrise, when you can expect frequent openings and often strong signals into the southern hemisphere. Daytime short skip to about 1,000 miles is expected, and beyond 750 miles after dark.

80 and 160 meters

Worldwide DX can be expected from local sunset through the darkness hours on Good (G) nights, limited of course by thunderstorm static on some paths. Short skip at night will extend between 1,000 and 2,000 miles.

NEUFR SRY DIE

continued from page 27

and burning. Yes, I've been very critical of the League for not bothering to try to promote the hobby. Well, by now it's clear that no matter how severe the emergency, they're not planning to do anything. Nor is the ailing ham industry.

And that puts the ball in your court. Well, your local ham club, anyway. We need promotion. We need to get the word out to the public that there still is such a hobby and that it's a lot of fun. Plus, if one takes advantage of the opportunity, it can be very educational and lead to some great careers.

I've been doing my bit by getting on the radio with Art Bell W6OBB and talking up the hobby for hours. My guest appearance in January led to several hundred new subscribers, plus piles of mail asking for more information. Well, as I keep explaining. amateur radio has provided me with a lifetime of excitement and adventure. Of course, this only happens if you are the kind of person who quickly answers the door when opportunity knocks. 90% of the public just puts in their ear plugs.

What can you do? That's easy! There are thousands of radio talk shows. Thousands. So get busy and get yourself interviewed by a radio talk show host. I've been on dozens of talk shows, talking up the hobby. I've been pushing it when I lecture to college groups about entrepreneurialism. I push it when I'm addressing scientific audiences

Imagine what would happen if a thousand hams got busy talking up our hobby on talk radio! Hey, you're hams and used to talking on the radio, so what's the big deal? Of course, if you are mike shy, then at least help to get me set up for an interview. I'm used to it and I know what the hot buttons are to get the public interested.

Well, that's simple. I just point out what the benefits are to them of becoming a ham. For instance, once you have a ham rig, you are never again going to be lonely—unless you want to be, and turn off the big switch.

When I'm visiting some new city, I have my HT along and presto, I'm in a contact with two or three locals. I get invites to come over to visit. I get good advice on restaurants and local activities. What a difference from being cooped up in a hotel or motel room with nothing but the

TV for company. Phooey.

And when I visit other countries, I have fraternity brothers eager to welcome me and show me around

Now get busy. Get your club members to find out about any local radio talk shows and see how many hams you can get interviewed as guests. Set me up for a guest shot.

If the general public doesn't know ham radio exists, we aren't going to grow. We need exposure to build that awareness. Explain how simple it is to get our entry license. Heck, we have four-year-old hams! And seven-year-old girls with Extras.

Invite the listeners to your club meetings. Explain about how much fun using our repeaters can be. Tell 'em about our two dozen ham satellites. Moonbounce, DXing, contests, foxhunting, and so on. Packet, slow scan, RTTY, and other aspects of the hobby. Get 'em excited. And explain that it doesn't take a genius, and that the Morse code barrier has gone the way of the Berlin Wall.

Life Fields

A couple of years ago, I tried to get you to build a millivoltmeter and write a construction article so that the readers could get busy and start measuring the millivolt life fields which are around every living thing. If you can find a copy of *Blueprint for Immortality* by Professor Harold Burr (Yale), you'll get more details on his pioneering work. But even without that reference, you should be able to replicate a lot of his work.

Using a millivoltmeter, you'll be able to check on the health of people or animals. It can tell you when a woman is going to ovulate, which is particularly valuable information for couples anxious to have a child. It'll also give early warning when a cancer is being formed. It can be used to detect mental problems.

You're an electronic expert, so get busy with this and let me know what you learn so that I can pass it along and get others to join in the research.

No, I don't know where the measurements are made, so let us know about that, too.

Fetal Bombs

Maybe you noticed the *Newsweek* cover story about the effects prenatal influences can have on people later in life. If you are the kind of person who stops and thinks about things (which seems to be a rarity these days), it

makes sense that anything that happens to you during your first weeks and months of life can easily influence your whole life.

A baby starts learning much earlier than most people realize. The book The Prenatal Classroom explains how a baby can learn around a hundred words before it's born. And there are several things parents can do which will substantially increase a baby's IQ. I've written about some of these, and plan to at least do a booklet on how parents can raise their baby's IO by around 40 to 50 points, putting many babies into the genius class, and perhaps helping the child become a prodigy.

One problem with helping babies to learn is that many parents are unaware that babies go through phases when their brains will grow incredibly, if given the proper stimulation. The sad part is that lacking that stimulation, the brain will never again be able to replace that lost growth. Depriving children of the needed stimulation is akin to chopping off one hand or a foot as far as permanently hobbling the child is concerned.

For instance? Have you read about the IQ difference between babies which are breastfed and those which are bottlefed? It runs 5 to 8 points! And that can be the difference between being able to cope with college and not.

It's nice to start seeing some of this information appearing in magazines like *Newsweek*. If you're interested in reading more, check the books on the subject that I've reviewed in my *Secret Guide to Wisdom*.

Micro Web Server

A graduate student at the University of Massachusetts has built what is believed to be the world's smallest Web server. It's about the size of a match-head and costs less than 4¢ to make!

In the first six weeks after going on-line, the server has served about 45,000 Web pages to about 6,000 users from 56 countries. Check out www.ccs.cs.umass.edu/-shri/iPic.html, where you'll find a picture of the computer compared with a quarter.

So what? If the chips operating your household appliances are replaced with these servers, you'll be able to program your VCR from anywhere, even your car, turn on your microwave oven to cook that roast, set the thermostat to warm up your home, and so on. Hmm, does your garden or lawn need watering?

Okay, get your brain into gear and let's see how many ham applications you can come up with. How difficult will it be to get on the air via the Internet from your home station from anywhere in the world and work that DXpedition? Or will our DX clubs start installing remotely operated stations in the rarest countries for anyone to put on the air from anywhere? What a way to operate from Spratley Island for the next contest!

Bum Dope

A letter from a reader who asked the HamVention forum chairman how come I wasn't on the program was told that this was my choice, not theirs, plus that I'd demanded a \$1,000 speaking fee, plus all expenses (first class air, hotel, food).

Holy mackerel! I don't demand a \$1,000 speaking fee. And the only time I travel first class is when I'm flying on free airline miles from my Continental Airlines Visa card. I don't think I've ever required the Ham-Vention to pay any of my expenses for anything, although I do ask most hamfests to pay for my air fare and hotel.

I love giving talks at hamfests and conventions, and I always draw the biggest audiences. Well, I'm controversial and I make sure my talks are both fun and educational. I try to get as many hams as I can interested in taking advantage of the fun and excitement ham radio can provide.

I've been speaking at quite a few universities about entrepreneurialism, giving keynote talks at educational, music, and science conferences, and having a lot of fun lately being a guest on talk radio shows. I talk about how easy it is to make money, to enjoy excellent health, how to improve our school system and, in particular, about amateur radio. I was the keynote speaker at the New Hampshire Reform Party's 1999 Convention, I got a free lunch out of it. You can get a copy of my speech for a buck (item #85). See my ad or check out www.waynegreen.com.

I suppose it would be too embarrassing for the forum chairman to admit that the League had pressured him to keep me from speaking, thus that crock about me demanding \$1,000, and so on.

With it getting ever easier to do videos, I've invested in a new digital video camera and

Continued on page 64

Wise Up!

Here are some of my books which can change your life (if you'll let 'em). If the idea of being healthy, wealthy and wise interests you, start reading. Yes, you can be all that, but only when you know the secrets which I've spent a lifetime uncover-

.....Wayne

The Bioelectrifier Handbook: This explains how to build or buy (\$155) a little electrical gadget that can help clean the blood of any virus, microbe, parasite, fungus or yeast. The process was discovered by scientists at the Albert Einstein College of Medicine, quickly patented, and hushed up. It's curing AIDS, hepatitis C, and a bunch of other serious illnesses. The circuit can be built for under \$20 from the instructions in the book, \$10 (01)

The Secret Guide to Wisdom: This is a review of around a hundred books that will help you change your life. No. I don't sell these books. They're on a wide range of subjects and will help to make you a very interesting person. Wait'll you see some of the gems you've missed reading. \$5 (02)

The Secret Guide to Wealth: Just as with health, you'll find that you have been brainwashed by "the system" into a pattern of life that will keep you from ever making much money and having the freedom to travel and do what you want. I explain how anyone can get a dream job with no college, no résumé, and even without any experience. I explain how you can get someone to happily pay you to learn what you need to know to start your own business. \$5 (03)

The Secret Guide to Health: Yes. there really is a secret to regaining your health and adding 30 to 60 years of healthy living to your life. The answer is simple, but it means making some difficult lifestyle changes. Will you be skiing the slopes of Aspen with me when you're 90 or doddering around a nursing home? Or pushing up daisies? No, I'm not selling any health products. \$5 (04)

My WWII Submarine Adventures: Yes, I spent from 1943-1945 on a submarine, right in the middle of the war with Japan. We almost got sunk several times, and twice I was in the right place at the right time to save the boat. What's it really like to be depth charged? And what's the daily life aboard a submarine like? How about the Amelia Earhart inside story?If you're near Mobile, please visit the Drum, \$5 (10)

Wayne's Caribbean Adventures: My super budget travel stories - where I

visit the hams and scuba dive most of the islands of the Caribbean, You'll love the special Liat fare which let me visit 11 countries in 21 days, diving all but one of the islands, Guadeloupe, where the hams kept me too busy with parties. \$5 (12)

Cold Fusion Overview: This is both a brief history of cold fusion, which I predict will be one of the largest industries in the world in the 21st century, plus a simple explanation of how and why it works. This new field is going to generate a whole new bunch of billionaires, just as the personal computer industry did. \$5 (20)

Cold Fusion Journal: They laughed when I predicted the PC industry growth in 1975. PCs are now the third largest industry in the world. The cold fusion ground floor is still wide open, but then that might mean giving up watching ball games. Sample: \$10 (22). Julian Schwinger: A Nobel laureate's talk about cold fusion-confirming its validity. \$2 (24)

Improving State Government: Here are 24 ways that state governments can cut expenses enormously, while providing far better service. I explain how any government bureau or department can be gotten to cut it's expenses by at least 50% in three years and do it cooperatively and enthusiastically. I explain how, by applying a new technology, the state can make it possible to provide all needed services without having to levy any taxes at all! Read the book, run for your legislature, and let's get busy making this country work like its founders wanted it to. Don't leave this for "someone else" to do. \$5

Mankind's Extinction Predictions: If any one of the experts who has written books predicting a soon-to-come catastrophe which will virtually wipe us all out is right, we're in trouble. In this book 1 explain about the various disaster scenarios, from Nostradamus. who says the poles will soon shift, wiping out 97% of mankind, to Sai Baba, who has recently warned his followers to get out of Japan and Australia before December 6th this year. The worst part of these predictions is the accuracy record of some of the experts. Will it be a pole shift, a new ice age, a massive solar flare, a comet or asteroid, a bioterrorist attack, or even Y2K? I'm getting ready, how about you? \$5

Moondoggle: After reading René's book, NASA Mooned America, I read everything I could find on our Moon landings. I watched the videos, looked carefully at the photos, read the astronaut's biographies, and talked with some of my readers who worked for NASA. This book cites 25 good reasons I believe the whole Apollo program had to have been faked. \$5 (32)

Classical Music Guide: A list of 100 CDs which will provide you with an outstanding collection of the finest classical music ever written. This is what you need to help you reduce stress. Classical music also raises youngster's IQs, helps plants grow faster, and will make you healthier. Just wait'll you hear some of Gotschalk's fabulous music! \$5 (33)

The Radar Coverup: Is police radar dangerous? Ross Adey K6Ul, a world authority, confirms the dangers of radio and magnetic fields. \$3 (34)

Three Gatto Talks: A prize-winning teacher explains what's wrong with American schools and why our kids are not being educated. Why are Swedish youngsters, who start school at 7 years of age, leaving our kids in the dust? Our kids are intentionally being dumbed down by our school system - the least effective and most expensive in the world. \$5 (35)

Aspartame: a.k.a. NutraSweet, the stuff in diet drinks, etc., can cause all kinds of serious health problems. Multiple sclerosis, for one. Read all about it, two pamphlets for a buck. (38) One Hour CW: Using this sneaky

booklet even you can learn the Morse Code in one hour and pass that dumb 5wpm Tech-Plus ham test. \$5 (40) Code Tape (T5): This tape will teach you the letters, numbers and punctuation you need to know if you are going on to learn the code at 13 or 20 wpm. \$5 (41) Code Tape (T13): Once you know the code for the letters (41) you can go immediately to copying 13 wpm code (using my system). This should only take two or three days. \$5 (42)

Code Tape (T20): Start right out at 20 wpm and master it in a weekend. \$5 (43)

Wavne Talks Not at Dayton: This is a 90-minute tape of the talk I'd have given at the Dayton, if invited, \$5 (50) Wayne Talks at Tampa: This is the talk I gave at the Tampa Global Sciences conference. I cover cold fusion, amateur radio, health, books you should read, and so on. \$5 (51)

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Reprints of My Editorials from 73. Grist 1: 50 of my best non-ham oriented editorials from before 1997, \$5 (71) Grist II: 50 more choice non-ham editorials from before 1997.\$5 (72)

1997 Editorials: 148 pages, 216 editorials discussing health, ideas for new businesses, exciting new books I've discovered, ways to cure our country's more serious problems, flight 800, the Oklahoma City bombing, more Moon madness, and so on. \$10 (74)

1998 Editorials: 168 pages that'll give you lots of controversial things to talk about on the air. SIO (75)

1999 Editorials: 132 pages of ideas, book reviews, health, education, and anything else I think you ought to know about, \$10 (76)

2000 Editorials: In the works.

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Wayne's Bell Saver Kit. The cable and instructions enabling you to inexpensively tape Art Bell W6OBB's nightly 5-hr radio talk show. \$5 (83) NH Reform Party Keynote Speech. It wow'd 'em when I laid out plans for NH in 2020, with outstanding and lower cost schools, no state taxes at all, far better health care, a more responsive state government, etc. \$1 (85)

Stuff 1 didn't write, but you need: NASA Mooned America: René makes an air-tight case that NASA faked the Moon landings. This book will convince even you. \$25 (90)

Last Skeptic of Science: This is René's book where he debunks a bunch of accepted scientific beliefs such as the ice ages, the Earth being a magnet, the Moon causing the tides, and etc. \$25 (91)

Dark Moon: 568 pages of carefully researched proof that the Apollo Moon landings were a hoax. This is a capping blow for René's skeptics. \$35 (92)

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The 73 Flea Market, Barter 'n' Buy, costs you peanuts (almost)— comes to 35 cents a word for individual (noncommercial!) ads and \$1.00 a word for commercial ads. Don't plan on telling a long story. Use abbreviations, cram it in. But be honest. There are plenty of hams who love to fix things, so if it doesn't work, say so.

Make your list, count the words, including your call, address and phone number. Include a check or your credit card number and expiration.

If you're placing a commercial ad, include an additional phone number, separate from your ad.

This is a monthly magazine, not a daily newspaper, so figure a couple months before the action starts; then be prepared. If you get too many calls, you priced it low. If you don't get many calls, too high.

So get busy. Blow the dust off, check everything out, make sure it still works right and maybe you can help make a ham newcomer or retired old timer happy with that rig you're not using now. Or you might get busy on your computer and put together a list of small gear/parts to send to those interested?

Send your ads and payment to: 73 Magazine, Barter 'n' Buy, 70 Hancock Rd., Peterborough NH 03458 and get set for the phone calls. The deadline for the July 2000 classified ad section is May 10, 2000.

President Clinton probably doesn't have a copy of Tormet's Electronics Bench Reference but you should. Check it out at [www.ohio.net/~rtormet/index.htm]—over 100 pages of circuits, tables, RF design information, sources, etc. BNB530

TELEGRAPH COLLECTOR'S PRICE GUIDE: 250 pictures/prices. \$12 postpaid. ARTIFAX BOOKS, Box 88, Maynard MA 01754. Telegraph Museum: [http://wltp.com]. BNB113

Great New Reference Manual with over 100 pgs of P/S, transistor, radio, op-amp, antenna designs, coil winding tables, etc. See details at [www.ohio. net/~rtomet/index.htm] or send check or M.O. for \$19.95 + \$2.00 P&H to RMT Engineering, 6863 Buffham Rd., Seville OH 44273.

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NEUER SAY DIE

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iMacDV for editing. I'll try doing some talks that way. I've done that in the past for some computer conventions and it's gone over well. In that way I won't have Io be away to give my talks, and hamfests won't have to pay my travel expenses.

Cool, Man!

Art Bell W6OBB has been going on at length about global warming. So it was interesting when Hilly Rose, one of his guest hosts, interviewed a weather expert. According to Accuweather, the company corporations turn to when they want more accurate forecasts than the weather bureau can provide, satellite data has shown that the Earth has been cooling for the last 18 years. It's down 0.45°C in the last hundred years.

The Hartland Institute research has shown no warming trend, nor has the research done by Pace University.

Hilly has since been terminated as a guest host, so perhaps Art got upset. Art has been playing reruns of his old shows and having other guest hosts instead.

Yes, yes, I know about the melting ice in Antarctica.

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Foxy **ELTs**

Build Two Rcvrs



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QRX . . .

Restructuring Summary

For those of you who never got it, or got it and still don't get it, here is a good review of the basics of the FCC's recent Report and Order restructuring the ARS.

The bottom line was that starting on April 15, 2000, there would be the license classes — Technician, General, and Amateur Extra — and a single Morse code requirement — 5 wpm.

"We believe that an individual's ability to demonstrate increased Morse code proficiency is not necessarily indicative of that individual's ability to contribute to the advancement of the radio art," the FCC said.

Besides drastically streamlining the Amateur Radio licensing process, the FCC said its actions would "eliminate unnecessary requirements that may discourage or limit individuals from becoming trained operators, technicians, and electronic experts."

Although no new Novice and Advanced licenses will be issued after the effective date of the Report and Order, the FCC does not plan to automatically

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5/5 Oh, Oh!

With May 5, 2000, looming, I got out my copy of Richard Noone's 5/5/2000 Ice the Ultimate Disaster book. Well, it won't be long before 5/5, like Y2K, is history. Will the every six thousand year alignment of the planets, plus the buildup of ice, off center, at the poles, trigger a pole shift? Could Nostradamus, in his prediction of a coming pole shift, which he said would wipe out 97% of mankind, be off by a few years? Will Chet Snow's Mass Dreams of the Future, which also predicts a mass extinction at around this time, be wrong, too? Then there's René's Last Skeptic of Science, which makes a really good case for past pole shifts having caused mass extinctions.

Chet Snow's book was the result of projecting hundreds of people under hypnosis into their next lives. He found that 98% were unable to reincarnate in the 21st century, due to an acute shortage of babies. By the 22nd century it was down to 90% unable to reincarnate. He traced this back to some sort of catastrophe in the very early 21st century. Like around now.

Okay, okay, so maybe Nostradamus has just made a long streak of incredibly lucky guesses in the past. And though J.B. Rhine's work 50 years ago, plus that more recently at the Princeton PEAR Labs, has scientifically proven the reality of precognition, with Dean Radin's The Conscious Universe leaving even the most dedicated skeptics no place to hide from the results of hundreds of scientific research projects, outfits such as SCICOP have their blinders strapped on so tightly that no amount of scientific proof is visible.

So, I'll be seeing you in June, right? Either here in my editorial, or in a truly massive crowd at the Pearly Gates. Whistle your call, if you're a ham, so I can find you.

ARRL's New President

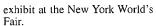
I see where the ARRL directors have elected a new president. Yes, that got me to thinking. In my memory, I can't think of a single ARRL president that's made even the slightest mark on the hobby. It's a position of enormous perceived prestige and virtually zero importance. The reality that I see is that the ARRL presidency is a show position, with no more power over the League than the directors, and that, in my experience, has also approached zero. It's all a necessary façade to bolster the pretense that the League is somehow connected to the members.

The League is actually run by a small group at HQ, and all the rest seems to be just window dressing. Who you elect as directors is irrelevant, and who they elect as president seems ditto.

No, I see the League as not even remotely democratic. It's a commercial publishing house posing as a membership organization in order to get preferential tax and postal advantages.

I remember the most prestigious president they ever had, Herbert Hoover Jr., the son of the president who got the blame for the depression that Congress, bowing to pressure from the banks, caused — mainly with the Hoot-Smalley tariff act. Wall Street collapsed like the house of cards it was and it took WWII to get us out of the mess.

I talked with Hoover W6ZH a few times and found him a nice guy, but not top-heavy with brain power. By a strange coincidence, Hoover resigned as president of the League just three days after I visited his good friend Barry Goldwater K7UGA, and explained in detail the many ways the League General Manager had been taking advantage of Hoover's naïvety, getting him to do the League's dirty work — such as visiting the president of Venezuela to get the ham radio exhibit out of the Venezuelan



The ham manufacturers, in frustration over the League's ham station in the Coca Cola exhibit, which they felt had been sold out to Hallicrafters, had made a deal with Venezuela to feature a large operating ham radio station as the centerpiece of their exhibit. It was beautiful and showed off the equipment of all of the ham manufacturers (except Hallicrafters, naturally).

The original deal between the League and Coca Cola, according to Bill Leonard W2SKE, who set the deal up in the first place and was a very good friend of mine (we flew around the world together, visiting 26 countries and operating on 20m from the plane as we flew), was for the ham station to take up most of the ground floor of the exhibit building. When Bill learned that the League General Manager had made an under-the-table \$25,000 deal with Hallicrafters to use only their equipment, he told me he then informed his contact at Coca Cola. The company quickly canceled their plans for the big exhibit and gave the league a small room on the second floor, next to the toilets, for their exhibit. Few fairgoers ever saw ARRL's ham exhibit.

Meanwhile, Hammarlund spearheaded a ham industry cooperative effort to get a better showplace for the hobby. They got Venezuela to go for it. The resulting exhibit was one hams could be proud of and was visited by millions of fairgoers.

ARRL HQ was furious, so they got Hoover to try to get the president of Venezuela to stop the competing ham station.

Well, that was just one of many times ARRL used Hoover's name, as I explained to Barry.

Oops, I sure got off on a tangent. Fortunately, that hardly ever happens.

Now, is the above "trashing the League"? Or is it just expressing my opinion, based on the facts as I understand them — as a 60-year loyal member? Yes, I'm critical of some of the things HQ does, but I'm far more critical of the things they don't do, but should.

The League does a nice job of publishing. Oh, I'd run QST differently, if I was the publisher, but they put out some excellent books. And where would we be with out their Q&A manuals to make getting a ham ticket just a matter of memorizing a few A's? That's all I had to do. Later the Navy did a wonderful job of teaching me electronic theory.

I'd like to see the ARRL directors communicating from the members to HQ rather than the other way around. The operation of the League has always been much more like the Kremlin than Congress. I'd like to see a League president who had the power to hire and fire the HO staff, and who would be paid something more than an expense account. We (speaking as a member) need a president who can get on AM radio and TV and help promote the hobby. We need one who can visit the heads of foreign countries and help amateur radio to grow in those countries, as I did when I visited King Hussein. This kind of activity could help us a lot when amateur radio matters are up for votes at future International Telecommunications Union conferences, where we need as many countries supporting us as we can get.

I'll tell you what. Find the oldest ARRL member you can and ask him to cite one single thing any ARRL president has ever done of any significance for the hobby. Please advise.

Continued on page 34



continued from page 1

upgrade any existing license privileges. The ARRL Thanks to had proposed a one-time, across-the-board upgrading of current Novice and Tech Plus licensees to General class, but the FCC declined to adopt the idea. This means that current licensees will retain their current operating privileges, including access to various modes and subbands, and will be able to renew their licenses indefinitely.

Starting April 15, 2000, individuals who qualified for the Technician class license prior to March 21, 1987, would be able to upgrade to General class by providing documentary proof to a Volunteer Examiner Coordinator, paying an application fee, and completing FCC Form 605.

The FCC's decision not to automatically upgrade Novice and Tech Plus licensees means the current Novice/Tech Plus HF subbands will remain and not be "refarmed" to higher class licensees as the ARRL had proposed. The FCC said it did not refarm these subbands because there was "no consensus" within the amateur community as to what to do with them.

The FCC decided to lump Technician and Tech Plus licensees into a single licensee database, all designated as "Technician" licensees. Those who can document having passed the 5 wpm Morse code examination will continue to have the current Tech Plus HF privileges. The FCC said it may request documentation from a licensee or VEC to verify whether a licensee has passed a telegraphy examination.

The FCC action also authorizes Advanced Class hams to prepare and administer General class examinations, and eliminates Radio Amateur Civil Emergency Service (RACES) station licenses. RACES will remain, however.

Under the new licensing scheme, there will be four examination elements. Element 1 will be the 5 wpm Morse code exam. Element 2 will be a 35-question Technician exam; Element 3 will be a 35-question General exam; and Element 4 will be a 50-question Amateur Extra exam. The FCC has left it in the hands of the National Conference of VECs Question Pool Committee to determine the specific mix and makeup of written examination questions.

Elimination of the 13 and 20 wpm Morse requirements means an end to physician certification waivers for applicants claiming an inability to pass the Morse code examination due to physical handicap.

The FCC disagreed with the League's suggestion that it undertake a restructuring of operating privileges along with licensing restructuring. The Commission said it wanted to give the amateur community a chance to "reach a consensus" regarding new technologies before it tried to restructure amateur operating privileges and frequencies.

A copy of the entire Report and Order (FCC 99-412) is available at [www.arrl.org/announce/regulatory/wt98-143ro.pdf] or [www.fcc.gov/

Daily_Releases/Daily_Business/1999/db991230/fcc99412.txt].

Lanuary 2000 issue of WIRELOOSE, monthly newsletter of Woodbridge (VA) Wireless Inc.

St. Louis = Heils

Julie Heil is a local morning anchor for "Good Morning America" on Channel 30. Just a few remote control buttons away, her father, Bob "High Tech" Heil, is the guy with all the high-tech and electronics answers on Channel 5's morning show.

"We're never on opposite each other," Julie said. "I usually miss him because he's on the early block. I'm usually in the shower or hitting the snooze button."

Bob hits the Channel 5 airwaves during the week in the 5 to 7 a.m. slot, and Julie is on between 7 and 9 a.m. Monday through Friday during "Good Morning America."

It's a miracle that both she and her father are on the early shows, because neither of them is a morning person, Julie said. "I think it's genetic."

Bob said he always watches Julie. If he can't, he tapes the show and watches it later. Then the entire family can watch Julie and critique her hair, makeup, and script.

"They are tougher on me than the news director," Julie said with a laugh. "He thinks he's hard on me? He should come listen to my family."

"Well, I usually tell her her hair didn't look so good or something. Or her shirt looked nice," Bob said. "I critique the good and the bad."

"What are parents for? They are very honest about it." Julie said.

Julie, 31, of Fairview Heights, has been a morning news anchor for KDNL, Channel 30, since January.

Bob, 58, of Belleville, has been the high-tech guy at Channel 5 for about a month. He also owns Heil Sound Ltd. in Fairview Heights.

"For some reason, the guys at Channel 5 won't let me wear my button," Bob said chuckling. "The button says, 'Watch my daughter Julie, next on Channel 30."

Julie said she decided to pursue a broadcasting career because she grew up listening to her dad on KMOX radio and meeting people in the entertainment business.

"Being around my dad and his lifestyle, I was always in front of people. I was in theater and musicals in high school," Julie said. "I think I'm the shyest person in the world, but I've learned to overcome it."

When Julie decided she wanted to pursue a career in television broadcasting, she knew exactly what position she wanted.

"When she was in high school, I asked her what she wanted to do," Bob said. "She said she wanted to be a news anchor for Channel 5."

Using connections he made through his ham radio hobby, Bob knew someone who knew someone who was able to arrange for Julie to

be on the set of "The Today Show" in New York to watch Jane Pauley in action.

"When you are 18 years old and standing on the set of 'The Today Show' and you just started broadcasting school, that's just a great incentive," Julie said. "Jane is one of the biggest people in broadcasting whom I admire."

Before landing the news anchor position at Channel 30, Julie worked the "vampire shift" at Channel 5. "I met a lot of wonderful people at Channel 5 who are still friends," Julie said.

"And people are always coming up to me and asking me about her," Bob added.

Although Bob enjoys his spot on Channel 5, he said he misses radio.

"I had an hour on KMOX. I get three minutes on Channel 5. What can I do in three minutes?" he asked. "I miss taking calls from people, too. I like talking to people. But, I can show things on TV that I couldn't on the radio."

Before moving to Channel 30, Julie was at an ABC affiliate station, WAND, in Decatur. She wanted to come back to the St. Louis market and to her family. Through an agent, Julie learned that Channel 30 had an opening. The agent also knew that Bob knew the news director and recommended she ask her dad to get in touch with the news director.

"He knew the news director from when he was at KMOX." Julie said. "He called down there and touched base with him."

Dad opened the door, and then it was up to Julie to prove herself.

Julie said she loves her job and enjoys going to work — even if she does have to get up with the chickens.

"For me to get up that early in the morning when I'm not a morning person tells me I'm in the right job with the right people," she says.

Reprinted with permission from and thanks to Jennifer A. Bowen, Editor, Lifestyle section, Belleville (IL) News-Democrat.

Johnson Space Center Amateur Radio Club Offers "Remote Membership"

The Johnson Space Center Amateur Radio Club, in the NASA complex in Houston TX, is offering "remote membership" to anyone wishing to join. The JSARC is the club which, among lots of activities, teaches astronauts to be ham radio operators. The club's callsign is W5RRR. Membership is \$15 per year, and patches are available as well.

For more information, please contact club secretary Larry Dietrich, at (281) 483-9198, or Email him at [Idietric@ems.jsc.nasa.gov].

Thanks to Kent Castle, NASA/Houston, and the January 2000 Badger State Smoke Signals.

From the Ham Shack

Dan Calzaretta NX9C. I have finished reading the FCC info on restructuring (40 pages of report and 30 supplemental pages). This is what I think: Overall, I think it is a great idea. I am also glad about the code—and I do 90% of my operating on CW! I really agree with the statement by the FCC: CW proficiency does not mean good operating skills.

I just don't buy the argument that I see on some of the ham radio newsgroups that the bands are going to be flooded by CBers. First, I hear some awful stuff on 80 and 20 meters NOW, and these people had to pass AT LEAST a 13 wpm code test.

I think the real key is better enforcement by the FCC (which seems to be happening) and better "self-policing" by the ham community.

It also means that every single amateur radio operator has a responsibility. We must show off our hobby and help those interested in becoming hams to understand what ham radio is about. I teach at a small private school and have a ham radio class and club station (N7XP — the Pacific Crest Community School Amateur Radio Club in Portland, Oregon). Kids still get excited about ham radio, despite what we hear about video games and the Internet.

What REALLY disturbs me is all of the "us" versus "them" that I see on the newsgroups. Real hams and not real hams. Ugghhhh. We are all hams. This is a hobby. It is supposed to be fun. And let's face it, if we don't get new people in we ALL will lose our frequencies due to lack of activity.

As to the code, this is where the most violent confrontations are happening in the newsgroups. (And by the way, talk about poor "operating" skills. Hopefully, most of the hams who are posting to the newsgroups spend more time on the Internet than on the radio. They must be terrible operators based on their foul language and lack of intelligent discourse on the Web!) Again, I LOVE CW. But I think that CW testing is no more or less valuable than testing someone's ability to set up and send various data modes, or the ability to construct a basic circuit, etc., etc. I see it not as a way to determine how dedicated someone is to ham radio as much as a "that's how I did it and everyone else should, too" response by some hams. I do think, though, that the CW portions of the bands should be protected for that exclusive use (along with data modes where appropriate).

The thing that is really regrettable about all of this is the hatred hams are feeling toward each other now. Who cares what class of license people are. Let's all have fun. I venture into the Novice CW portion of the bands and the Novice/Tech Plus portions of 10 meters whenever I can. Let's welcome people and embrace what they have to offer to the hobby and stop complaining about what class license they are and whether they took a 5 wpm test or 20 wpm test or no code test whatsoever.

I guess it is up to all of us as hams to do the following: (1) Help people get into the hobby. (2) Once they are in, treat them all equally regardless of license class. (3) Be good operators, so people learn by example how it should be done. (4) Stop fighting with each other, so we don't lose our frequencies. (5) Continue to push the FCC for better enforcement of the rules.

Well, I know that is a bit long-winded, but you are always asking for people to write! Keep up the good work.

H.B. (Cork) Corcoran W5BYG. Hi, Wayne: I've been a fan of yours since I first

started reading CQ, and I was a very early subscriber to 73. There are only two magazines where the first thing I read is the editorial. One was Astounding, now Analog Science Fiction, while John Campbell was editor, and the other is 73. Now to the reasons for this note. One of the subjects that was mentioned had to do with learning the code. Wayne, I haven't read your book on the subject so some of this may be redundant. I learned the code the wrong way, as most of us did, by memorizing the dits and dahs of each letter at a slow speed and then slogging my way upward toward 13 wpm, hitting the proverbial wall at about 9 or 10 wpm, which seemed to take forever before breaking through. Then my mind finally switched the way it was decoding the letters from the sound pieces of the letter to the sound of the whole letter. When this happened, my speed shot up to about 15 wpm in a matter of only a few days. I suspect this is what you advocate in your book, and that is learning the sound of the whole letter at about 15 wpm from the very beginning. Now comes the reason for all this preliminary discussion. A group of us that were

members of the McDonnell Douglas Amateur Radio Club at our astronautics facility in Huntington Beach CA (where the Saturn S-IV was designed and built) started practicing our code each day in one of the conference rooms during lunch. This was several years ago, and we were using a reelto-reel tape recorder with the 3-3/4, 7-1/2, and 15 ips selector switch. We were working on 15 wpm. One day when the code started, it was coming at us at 30 instead of 15 wpm because someone else had used the recorder and had changed the playback speed. Before the person running the tapes could get back over to the recorder, several of us had said, "just leave it there for five minutes," which he did. Admittedly, I was only able to copy a few letters during the time at that speed, but when we slowed the tape down to normal, it seemed so slow that we had all day between letters. We started doing this double-speed session for the first five minutes every day, and the rate that our copy speed started to progress was incredible. It seemed like it was no time at all before I was copying at 24 wpm. At this speed, another surprising thing happened. I started recognizing the sound of whole words and began to finally understand how old-timers could head copy code at what to me was incredible speeds of 40 or 50 wpm and above. They weren't listening to the letters, they were listening to the words, and it was just like someone talking to them. One of the things that really helped improve my accuracy and reduce errors was to force myself to copy behind by at least one letter. This allowed the brain to make corrections and climinate anticipation of the next letter as a word developed before writing the wrong letter on the paper. The further behind you can copy, the fewer mistakes you make.

Good advice! And yes, the secret of my Blitz Code Course is in starting 'em out learning the sound of the letters, not the dots and dashes. And then graduating to words. Tens of thousands have aced the code test after a weekend of practice this way. But that'll soon be irrelevant, with my one-hour 5 wpm super-blitz method being all that's needed. — Wayne.

Shin: a device for finding furniture in the dark.

Marshall G. Emm N1FN 2460 S. Moline Way Aurora CO 80014 [n1fn@MorseX.com]

When Less Is More

Check out the excitement of QRP.

About twenty years ago, when I first became interested in amateur radio, I was Elmered by some old-timers who delighted in telling me stories of what the hobby was like "back in the old days." Not only did they have to walk ten miles to school every day carrying their little brother and sister on their back, they had to pass a "real" examination, draw the schematic for a triple-conversion radio from memory, design a linear amplifier based on beer bottles, and send the entire text of the US Declaration of Independence at 30 wpm with no mistakes. They had to cut the firewood to make the fire to make the steam to generate the electricity to run their radios, which of course they had made themselves from a handful of paper clips, rocks, and spit. Twenty years farther down the coax, I'm the old-timer, entertaining the current crop of newbies with tales from the Golden Age of Ham Radio. I'm sure they think my stories are just as far-fetched, but I have a big advantage because I can literally recreate that world for them, through the wonders of modern QRP.

y definition, QRP is simply low power operation, specifically with 5W of RF output or less. In practice it is a large and growing movement within the ranks of amateur radio, a genuine avocation for most, and a way of life for many. At a time when the ham population as a whole has been declining, the ORP fraternity has been growing exponentially, QRP clubs are thriving, and the support industries, like kit manufacturers. have gone from strength to strength. Believe it or not, a few years from now it will be apparent that in a scant two decades, QRP has grown from being a special interest to become the life-blood and mainstream of the entire hobby.

How can this be? Isn't working with QRP power levels a handicap? Not at all. It's a somewhat arbitrary restriction of the one technical aspect of radio that has consistently worked against the interests of the hobby. Take away power, and you

> are left with skill. inventiveness, challenge, and enthusiasm, which are very similar to the attractions of the hobby in its earliest days. It all adds up to Fun with a capital F, and at very low cost.

QRP isn't much

of a handicap

The effectiveness of QRP communication, and the

quality of QRP equipment, can be explained very easily with a little math. I hear you groaning, but it is very simple math, and in fact you had to learn it to pass the Novice test. It's called the Power Ratio. Forget about logarithms and focus on the business end of the equation, the received signal. Signal strength is measured in S-points, which you can usually read directly from a meter on your radio. Your concern when transmitting is how many Spoints you are generating at the receiving station. The more, the better, right? Wrong. In the first place, if your signal is perfectly copyable at S-7, increasing the strength to S-9 achieves absolutely nothing, except perhaps additional pollution of the airways. And this one is actually engraved in stone, more or less, in Section 313a of Part 97 (the FCC's rules, for those who have forgotten): "An amateur station must use the minimum transmitter power necessary to carry out the desired communications." That says two things. First, if you have a perfectly good QSO going with an S-7 signal, you are breaking the law if you increase your power!

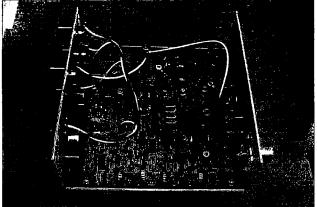


Photo A. Under the hood of a modern 5W single-band CW QRP transceiver-the Oak Hills Research OHR 100A, built from a kit.

Second, if all amateurs complied with the regulation, then most amateur QSOs would be conducted at QRP power levels!

Don't believe me? OK, let's look at the power ratio in action. Say you are transmitting with 5 watts and a station gives you a report of S-5. Now double your power to 10W and what happens? Your power output has increased by 3dB and the received signal has increased by the same 3dB, which is ... wait for it ... one half of one S-point. Double your power again, to 20W, and the received signal is now one whole S-point stronger. Double it again, to 40W and we are at 1.5 S-points. Again, to 80W and we are at 2 S-points improvement on our original 5W signal. 80W is near enough to what your typical "100W" transmitter puts out, and by now you should see what little difference an additional 20W would make. In summary, by going from 5W to 80W we have increased the received signal strength by all of two S-points. The reverse is true—if you are copying an 80W station at S-9 and he reduces power to 5W, you will still be copying him at S-7.

But let's not leave it there. Start at 100W and add 3 dB at a time by doubling power—you go to 200, 400, 800, then an illegal 1.6kW [that's section 313(b) if you're counting]. We doubled power 4 times, picking up 12dB or ... wait for it ... 2 S-points. Talk about diminishing returns!

But don't take my word for it-try it on the air sometime and see what happens. The only caveat is that the Smeters on most radios, if they are calibrated at all, are set for the standard S-9 at 50µV input—at any other input, larger or smaller, they are notoriously inaccurate. Personally, I think there's a lot to be said for honest reporting the old-fashioned way-in terms of perceived strength relative to other signals on the band-but that's another story for another time.

Money talks, and power walks

It is a generally accepted belief that adding power is simply the least effective thing you can do to improve your signal, and that's supported by the math as we've just seen. But power also equals money, and when you start talking kilowatts you are talking big dollars. Not just for the linear amp, but the antenna, transmission line, and tuner also have to be able to handle the juice. Priced a 1kW antenna tuner

It's probably fair to say that most hams realize how little benefit, relatively speaking, they will gain from investing in a 1.5kW setup. But at the same time, they have trouble coming to grips with the relative performance of their garden variety 100W transceiver as compared with, say, a 5W ORP transceiver.

The entry price for a 100W all-band HF radio is real close to \$1,000 now. You can buy or build a good QRP transceiver for around \$100. That, I suspect, is a major factor in new hams opting to go the QRP route.

Proof of the pudding

It's not in the eating — with QRP, it's in the achievements. Last weekend a friend of mine cranked his "full gallon" 5W transceiver down to QRPp levels-250mW output. He worked a station in PA, a distance of around 1,500 miles from Denver, with one quarter of one watt output. That works out to 4,000 miles per watt, and again it works both ways-all else being equal, yes, he could indeed have worked a station in Eastern Europe, 12,000 miles away, with one watt. We do it all the time!

Another friend has worked DXCC at QRP power levels, and is already within 10 countries of DXCC 2000. ORP Worked All States is a piece of cake, and I would bet a higher percentage of serious QRPers has done it than the HF crowd as a whole.

Also on the local scene, the Colorado QRP Club stages two separate operations for Field Day. One of them, the "Aloha site," is very laid back and casual, affording new members and other interested parties an opportunity to get on the air, try out their own radios, and generally have fun with no pressure. The other Field Day operation is about as serious as you can get, with towers, wire beams, a high altitude site, and the best operators we can find.



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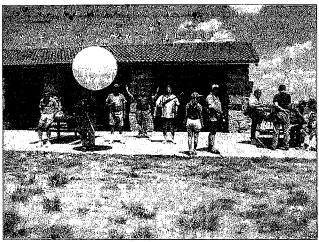


Photo B. The Colorado QRP Club's annual picnic features a "run for the trees" where members take off from the pavilion with whatever equipment they can carry, and race to get a station on the air. The balloon-lift worked.

The result last year was first place in 2-A, the largest category in Field Day. Not only that, we placed seventh *overall*. Only six out of the thousands of Field Day stations did better—and we did it with 5W.

My own introduction to QRP, within the first 6 months of my ham career, came when a visiting ham suggested I turn down the wick on my FT-101E and "really put my antenna to the test." I succeeded in working a station in the US, from Australia, with half a watt.

All the good gear

QRP equipment can be very simple, but the fact that we are working with

lower power circuits means that experimentation and inventiveness are possible for all of us. The QRP equipment industry is thriving, with several kit and accessory manufacturers enthusiastically supported by the market and new gear coming out constantly.

Quality? Can't beat it. Put your \$100 home-built radio next to a \$3,000 Ginzu box and the QRP rig

will clearly win more often than not. Surprises hell out of guys who have just mortgaged their XYL to buy the latest all-singing-and-dancing bells and whistles transceiver. But it shouldn't be a surprise, because the biggest part of what you are paying for in the "big rigs" is circuitry to make up for a front end like a barn door. Your typical QRP transceiver is thoroughly optimized for operation on a single band (or a few bands), CW only, and with very efficient signal processing from front-end to headphones. A good rule of thumb, which is proven by QRPers every day, is "if you can hear him, you can work him." And we have better "ears" than

> many of these guys who can boil water on their linears.

> I said CW only, there, didn't I? That's because CW is at the heart of QRP—it's what makes QRP possible as a hobby, and QRP becomes a very good justification for CW. The reason goes back to the math, but perhaps not quite as directly. Let me state this as a fact-all else being equal (operator

skill included), CW has an 18dB advantage over SSB. If you read the power ratio stuff earlier, you can see that 18dB is a HUGE difference. That's about the best I can do in terms of math, because ultimately you are comparing apples with oranges, but perhaps I can at least explain the sense of it. A CW signal is either there or it is not, and that's something the ear and brain can detect and work with very easily. SSB transmits the human voice, which consists of a wide range of frequencies and a wide range of amplitude or volume. The result is that the power used to transmit SSB is spread out over a "bandwidth" of a couple kHz. All of the power in a CW signal is concentrated in a couple of hertz. And in SSB, the peak power is used only on voice peaks, which are a very small percentage of the transmitted signal. So the 18dB figure is justifiable, if not exactly measurable (others will quote higher or lower figures, but it's all relative). In practice, especially when conditions are marginal, a 5W CW signal will work better than a 100W SSB signal. And again, you don't have to take my word for it. If you've worked much DX you know that often CW QSOs are possible long before SSB "comes in" and sometimes SSB never quite makes it. Even if you are not a DXer, you should be able to prove this to yourself very easily in half an hour on the air. If you are a real Doubting Thomas, do a real test. Get on the air with a buddy using SSB, and reduce power until you can no longer copy each other. Switch to CW at the same power level, and amaze yourself at how much farther you can reduce your output and still communicate.

As you might suspect, there is not a lot of SSB QRP activity, but there is some, especially since we are experiencing good propagation on 10 and 15m, where there is next to no noise and less power is needed. In fact, a large number of long-time QRP CW operators are turning to QRP SSB as the "next challenge."

There are two other important things about QRP equipment.

First, it tends to be small in size, light, and capable of operation from a small battery. This means it is a natural



Photo C. The Novice/Tech station at CQC's 1999 Field Day made a big contribution to the club's success, racking up over 150 QSOs—all QRP.

for portable operation, backpacking, and even bicycle mobile. Many of us take a complete HF radio station with us when we travel. Including a simple lightweight antenna, the whole kit and caboodle will fit in a briefcase, with room for a change of underwear.

Second, and finally, QRP transmitters are very clean. Again, because we are dealing with low power components, we have very effective filtration of harmonics and other spurious emissions. The result is that a ORP transmitter is far less likely to cause interference to nearby TVs, stereos, and telephones. QRPers are right at the bleeding edge of "stealth radio," many of us living under restrictive ordinances and covenants that might cause someone less dedicated to just give up on ham radio.

The ORP culture

A major factor in the continued growth and success of QRP is the cohesiveness of the QRP community. It is a community in all senses of the word, from local clubs to national organizations, special on-air events, and above all, an enthusiasm for communicating with each other that hasn't been seen in any other aspect of ham radio for half a century.

General radio clubs are dropping like flies, but QRP clubs are cropping up like mushrooms. There are several organizations with national and international membership, and local QRP clubs in almost every part of the country.

A year or two ago I went to a meeting of a "major" old-fashioned metropolitan radio club, one that has been in existence since the 1930s. They now have a total of

120 members, of which 9 attended the meeting. The program was on "laser printers." The last meeting of the Colorado QRP Club was attended by 50 members. We had a station on the air, and a program related to actual ham radio.

The Internet has been very important to the growth of QRP. Just to give you an indication of how much is available on the I-way, a search for "QRP" on Alta Vista turned up 23,745 page matches.

There is an Internet "Reflector" called ORP-L which has become the main universal communications channel for QRPers. It's like a mailing list,



Photo D. A QRP station capable of working the world will fit in a briefcase.

where a subscriber submits a message which is "reflected" to all other subscribers. At the moment there are something like 3,000 of them, from all over the world. QRP-L is a very good way to get "into" QRP. To subscribe, address an E-mail message to [listserv @lehigh.edu]. The subject doesn't matter. The test of the message should be SUBSCRIBE QRP-L your_name your_call.

Another good resource on the Internet is the Colorado QRP Club's Web site, which you will find at [www.cqc.org]. You might even think

Continued on page 61





Exploring the Kenwood TM-D700A

Part 1: Overview and installation.

Trying out new hardware can be fun. Trying out really neat new hardware can be a lot of fun. Having the chance to get my hands on the new TM-D700A radio from Kenwood has been more fun than I've had in a long time.

I had seen the ads and knew that it was a dual-bander that could also handle APRS, packet, HF SkyCommand™, and SSTV, but until I got my hands on it, I didn't have a clue as to how many features could be packed into such a small box. The advertisements for this radio have been understated, but I guess there's just so much even marketing experts can pack into a single ad. In fact, this radio has so many features that it's going to take two issues to tell you about all of them.

This month, I'll concentrate on the dual-band FM voice transceiver and its installation. Next time, I'll focus on its ability to function in advanced modes and capabilities, including packet, APRS, and slow scan TV (SSTV).

In my early days as a ham, the more features a radio offered, the larger and heavier it became; the more horns, bells, and whistles, the more knobs, buttons, and gauges. In the case of the TM-D700A, the physical hardware does not hint at everything this radio is

capable of. When I opened the box I found the actual radio, a control panel, the microphone and all of the cables, brackets, and the hardware needed to install it (Photo A). With the exception of the separate control panel, there was nothing that even hinted at how much I would be able to do with the TM-D700A.

The main unit measures 5.51" x 1.57" x 7.68" and weighs about 2.6 lbs.—fairly typical for a modern transceiver. It has two modular connectors on the front, one for the microphone and the other for the cable that connects to the control panel. There is a DB-9 socket to permit the connection to the serial port of a computer, and a mini phone jack which can be connected to a Global Positioning Satellite (GPS) receiver. There is also a 6-pin DIN connector for connection to an external TNC or video. On the back of the rig are the SO-239 connector for the antenna, the power cable, and two jacks for speakers. There is a mounting bracket included for mobile installation, and rubber feet if it will be used in a fixed location.

The control panel is about the size of a handie-talkie, measuring about 5" x 2" x 1" and weighing just over 6 ounces. It has three knobs, a dozen buttons, and an LCD display. Only the power button has a label. It also comes with a unique swiveling mounting bracket into which the control panel can be slid or removed easily. The microphone has four function buttons, the DTMF-type push-buttons, and. of



Photo A. The Kenwood TM-D700A comes complete with main unit, control panel, MC-53DM programmable microphone with alphanumeric keys and all necessary cables, brackets, and hardware. It even includes the cable for connection to a GPS receiver.

course, the push-to-talk button. Nothing looked too intimidating, so I decided to charge ahead.

I admit that I picked up the manual. but fortunately Kenwood has a "Ouick Start" section for those of us who tend to run short on patience when we've got a new toy. I connected the microphone, control panel, and main unit together, added an antenna, and connected it to my power supply. The control panel lit up with a welcome message and then switched to a display that indicated 2 meter FM on the left and 440 MHz on the right. The orange backlit screen was pleasant to look at, and each of the buttons now had a label on the LCD screen to explain its function. The frequency display is large and very easy to read; the function labels a little smaller, but still very plain. The contrast (which is adjustable) is excellent on this display, which is important since, as I would find out, there is a lot of information this will provide. Naturally, I immediately tuned it to my favorite local repeater to try it out just to make sure it worked. While this is not

Frequency Range (MHz)		
VHF	144–148	
UHF	438-450	
Receive Range (MHz)		
Band A	136–200	
	118–136	
	300-400	
	400–470	
Band B	400-524	
	136–175	
	800-1300	
Power Requirements		
Receive	1.0 A or less	
Transmit (max)	11.5 A or less	
Transmitter Power Output		
Low	Approx. 5 W	
Medium	Approx. 10 W	
High (VHF)	50 W	
High (UHF)	35 W	

Table 1. TM-D700A specifications.

a scientific test, and there's not a lot you can tell by doing that, it's a timehonored ritual every ham has to complete with every new rig. Once I was convinced that it was working, I began to explore what it could do and how it could do it.

The large knob at the bottom left of the control panel could be used to control the VFO or, when in memory mode, to change memorized channels. The two knobs on the right each controlled volume with the inner knob and the squelch level with the outer collar. By pressing the left knob, the left display became larger, indicating that it would be transmitting when I pressed the push-to-talk button, and I could switch to the frequency displayed on the right by pressing the right knob. It is very convenient to be able to switch bands and/or frequencies in such an intuitive manner. In fact, the more I learned about this rig, the more I was struck by how logical all the controls worked. It was time to read the manual and plan the installation of this rig into my car.

Mobile installation

Usually the biggest problem with a mobile installation is the need to find a location that is safe and convenient. and doesn't require that you be a contortionist to implement. With the TM-D700A, there are options not available for most units. The main radio unit has a mount that lends itself to being located in a number of out-of-the-way locations. It can be trunk-mounted, for example, either on the floor of the trunk behind the rear seat or under the shelf beneath the rear window. I have seen some installations in vans which used the space under the driver's seat, so I decided that I would mount the main unit under my car seat so that the microphone was accessible through the gap between the driver's side of the bench and the passenger's side. Generally, if I can mount a radio out of sight, it makes me feel more secure, and this not only hid the main radio unit, but also I could tuck the microphone under the armrest to hide it.

The control panel can be mounted virtually anywhere that is convenient. I toyed with locating it above the rear





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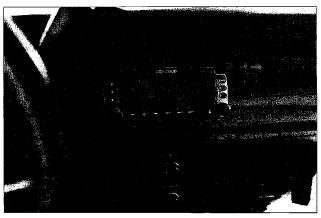


Photo B. The control panel's light weight allows it to be mounted almost anywhere. It is easily removable to discourage would-be thieves.

view mirror or on an open section of dashboard to the left of the steering wheel. I finally settled on mounting it to the right of the wheel where it is readily visible except when the gearshift lever is in reverse. Since I try to avoid complex radio operations while driving, and especially while driving in reverse, this seemed an appropriate location. I affixed the unique control head bracket to the dashboard and adjusted the angle of the display to ensure adequate visibility (**Photo B**).

If you prefer to install the main radio in the trunk or other remote location. Kenwood has cable extensions available to make this easy. To avoid confusion, all three modular plugs are configured differently. The microphone uses an 8-pin connector, and the interconnecting cable uses 6 pins at the main unit end and 4 pins at the control panel end. In any case, with this design, the main unit can be placed in a hidden location and the control panel can be removed when the vehicle is unattended. The control panel can easily be slipped into a briefcase, purse, or large pocket. Since Kenwood has made no secret of the fact that they do not sell replacement control panels, they have done their part to frustrate would-be radio thieves. Incidentally, adding a new rig to your car is an excellent time to review your insurance to make sure your radio is covered in the event of theft or damage. Many standard automobile policies do not cover ham radio equipment, so you may find it advantageous to look at a specific policy to cover your amateur gear.

With the dualband capability, Kenwood gave appropriate thought to connections. There is an internal speaker on the main unit into which the audio from both bands is fed. When installed in a remote location, such as in the trunk, an external speaker is

obviously required. Kenwood has made it possible to use the internal speaker, one or two external speakers, or a combination of internal and external speakers. If you run voice communications on both bands, you will have different requirements than someone who operates voice on one band while using the other for digital communications.

After I was satisfied with the installation, I began to program in the local repeater frequencies. There are 200 memory locations, so I was able to program in the local 2 meter and 440 repeaters, common simplex frequencies, and key digital frequencies as well as repeaters in areas where I might travel. When I have the memory capacity available, I tend to group frequencies so I can follow my own logic later on. For example, I might use memory locations 1-20 for local 2 meter repeaters, 21-40 for local 440 MHz. 41-60 for areas I visit, etc. In this way, I can overwrite out-of-area memories when necessary. With 200 memories, this is easily done. In fact, the radio is set up so that each of these blocks of 20 frequencies comprises a group and you can choose to monitor any individual group. To make it more convenient, memories can be stored with labels so you immediately know key details about the frequency. If you travel a lot, for example, the ability to indicate a city and a code such as "W" for a Skywarn repeater, "A" for ARES/ RACES, etc. is very helpful. I also like to store a few frequencies for receiveonly, such as the local NOAA weather radio and perhaps the tower frequency for the local airport. You can lock these out so they are not scanned, but can be accessed manually when needed.

Incidentally, there is now a software program that is available on the Internet either through the Kenwood Web site or [ftp://ftp.kenwood.net] which will allow you to load all of the memory functions from your computer into the TM-D700A. This can be done with any Windows 95 or 98 system and a standard DB9 cable. The program is currently in beta test, so by the time you read this, it should be well established. With this program, you can set up different configurations for traveling for each city where you might expect to operate, and load these files easily and conveniently.

Now that I had a few of the basics out of the way, I decided to sit down and thumb through the manual. It was then that I realized that I had not yet even scratched the surface of what this radio could do. Actually, there are two manuals, one covering regular communications and one addressing specialized communications. Both manuals are available on-line at [ftp://ftp.kenwood.net], so you can read up on all the details of the radio if you are so inclined.

One key bit of advice included in the manual is that if you tend to throw manuals out with the packing material — DON'T. Although this radio is very logical and almost intuitive, you'll find out that you need to refer to the manual on occasion, especially since there are many features you will be growing into. The FTP site has PDF copies for all current Kenwood radios. Not only does this allow you to read up on a product before buying it, but you'll never have to buy a spare or replacement manual again!

The basic features are laid out in front of the operator in such a manner as to make operating a joy. Designate one frequency as your "Call" frequency and you can jump to that frequency with a single press of a button on the front panel or the microphone. The same can be done to switch between memory and the VFO. There are six buttons along the bottom of the

Build and Compare

Learn about receivers from these two simple designs.

There are many excellent sources of information on HF receiver design available in books, periodicals, Web pages, and amateur radio's vibrant oral tradition (tales of questionable provenance). While the books occupying the several feet of shelf space I have devoted to this topic have been read cover-to-cover any number of times, nothing drives home a concept like the success or failure of experimentation. These two receivers are born in part from this desire to experiment, mixed with the fun of construction and the pride of using home-brew equipment.

he two radios meet different needs. The 31 meter broadcast band is my workbench companion, where I regularly listen to a variety of programming from Radio Canada International, BBC, Deutsche Welle, and Radio Netherlands while the soldering iron is hot. One radio is dedicated to this. The other is an auxiliary unit used to look for 20 meter activity while "the real radio"—my Drake R8—is busy doing something else, like receiving slow-scan.

Desirable features and functionality requirements common to both include:

• Must use readily available or easily made parts, preferably ones already on hand.

- Must fit on a single 3" x 5" singlesided PC board suitable for mounting in my favorite kind of enclosure.
- Should be a simple mechanical design—no critical parts placement, few controls. My mechanical ability is generally limited to drilling holes.
- Should have minimal dynamic range requirements. Unlike 40 meters, where broadcasters and amateurs intermingle with widely different signal strengths, 31 meters is broadcast only, while 20 meters is amateur only.

The 20 meter rig has a few more stringent requirements:

- Must be stable enough to receive CW and SSB.
 - Must have enough tuning resolution

to select relatively closely-spaced stations (whereas spacing is tyically 5 kHz on 31 meters).

31 meter design

Fig. 1 is the 31 meter block diagram, and Figs. 2 and 3 the schematic.

	31 Meter Parts List		
U1	NE602A double balanced mixer/oscillator	Philips	
U2	LM1458 dual op amp	National	
U3, U4	MC1350 IF amplifier	Motorola	
TI	455 kHz IF interstage xfmr	Toko 7MC- 452252NO	
T 2	455 kHz IF Toko 7LC- output xfmr 352713NO		
FL1	455 kHz ceramic filter, 6 kHz bandwidth Toko HCFM2 455B		
L1-L3	1 μH adjustable inductor	table Toko BTKXNS- T1050Z	
D1, D2	MVAM108 varactor tuning diodes	Motorola	

Table 1. 31m parts list.

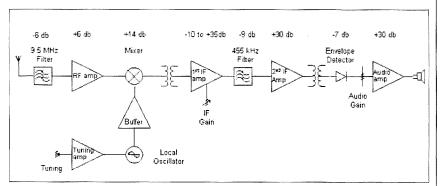
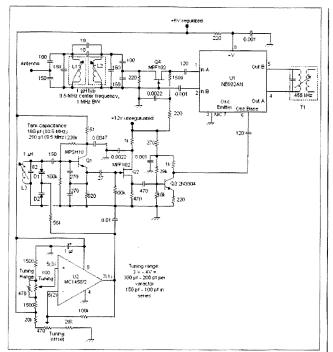
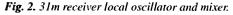


Fig. 1. 31m receiver block diagram.





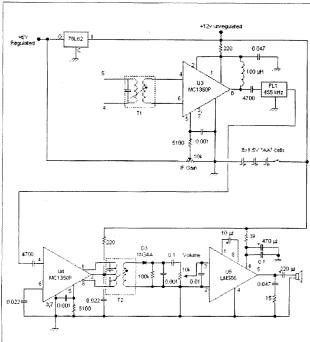


Fig. 3. 31m receiver IF and audio sections.

Common-gate RF amplifier Q4 overcomes the loss of the RF bandpass filter to feed the RF input to mixer U1. Local oscillator Q1, buffered by Q2 and Q3, supplies U1 with the local oscillator signal. The tuning voltage for the two varactors in Q1's tank is generated by one half of U2, which amplifies the rather small voltage change developed across the 100Ω 10-turn tuning pot.

RF and LO signals are converted by Ul to 455 kHz, and coupled through T1 to U3, the first IF amplifier, whose gain varies up to a maximum of about 35 dB according to the IF GAIN control setting. The output of U3 passes through the 6-kHz-wide filter to U4, the second IF amplifier. Transformer T2 couples the IF signal to the low impedance of envelope detector D3, in turn driving audio stage U5 through the volume control.

Eight "AA" batteries provide 12 V power. U6 produces +6.2 V regulated for the local oscillator itself, the local oscillator tuning amplifier, and the mixer. Current drain is about 60 mA at a reasonable audio level.

20 meter design

The antenna is coupled through a two-resonator preselector network to mixer U1, driven differentially through the secondary of T2. The local oscillator circuit is much simpler in this receiver, relying on a transistor internal to U1. The 30k 10-turn potentiometer available when this unit was built allows for sufficient varactor tuning voltage variation without the need for an amplifier. Q1 is an optional buffer amplifier used to isolate the local oscillator from an external frequency display I occasionally use.

First IF amplifier U2 drives a crystal filter through T3. T4 couples the filter's output to second IF stage U3. The gain of both stages is controlled by a 5k potentiometer. U3's high output impedance is transformed by T6, a standard 10.7 MHz IF transformer tuned up slightly to 10.9 MHz, nearer to 50Ω for input to double-balanced mixer module U4. A crystal-controlled

Continued on page 20

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Photo A. 31m receiver.

oscillator (see Note 1) provides about 0.5 Vrms to U4's local oscillator port.

The 51Ω resistor at U4's output port is required to provide a reasonable match both at audio frequencies and at the 21.8 MHz image frequency. The two sections of U5 provide audio gain and audio bandpass filtering (see Notes 2 and 3). U6 provides final audio power gain.

Design decisions: Demodulator

I would have preferred a synchronous detector for the AM receiver, but in the interest of simplicity, I chose to stay with the envelope detector, which is quite adequate. For the 20m receiver, I chose the double-balanced diode mixer rather than a Gilbert-cell entirely because I wanted to build a receiver using a hybrid DBM in this role.

Another NE602A could have been used here, as I have done in subsequent designs.

Overall gain

There are no IF interstage transformers in the 31 meter receiver, and as a result, lower overall gain because of increased loss incurred by impedance mismatches around the ceramic filter. This is entirely outweighed by the large signal strength of broadcast stations.

IF section

The "keep it simple" mantra weighed most heavily on the 31 meter design, where I felt having images in the input tuning range was a minor price to pay for using cheap, commercially-available coils and filters for 455 kHz.

On 20 meters, a narrower bandwidth than could be had with cheap ceramic filters was needed, and images would have been more of a problem, so a crystal filter was built. The major concern here was finding three crystals suitable for the filter and the BFO. The filter is slightly tunable by varying the surrounding capacitors, and the BFO may be tuned by pulling the crystal with the 20–125 pF trimmer. Both tuning ranges are small, though, and indeed, quite a few crystals were tried before the magic combination was found.

Coils and transformers

The 20 meter receiver does indeed have six home-made coils: two solenoids and four toroids. The three toroids surrounding the IF section allowed a good match into and out of the crystal filter, and allow the mixer and both IF amplifiers to run balanced. These are used for wideband impedance matching: The impedance ratios are somewhat important, but they are not frequency-determining components. Toroid transformer T5, which couples the BFO to the product detector, is part of a tuned circuit, but is only a frequency determining component in that the crystal must oscillate at its fundamental rather than a harmonic.

Lessons learned

Building and comparing these radios gives an appreciation for why the literature stresses certain characteristics at both the architectural and detailed

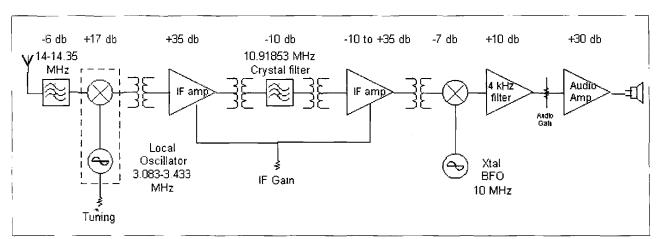


Fig. 4. 20m receiver block diagram.

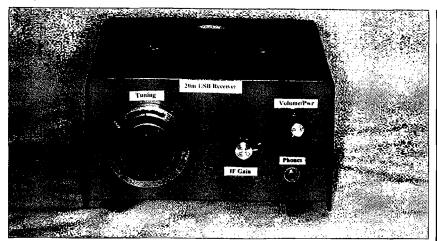


Photo B. 20m receiver.

circuit levels. At the same time, it shows how narrowing the range of re-

	20 Meter Parts List		
U1	NE602A double balanced mixer/oscillator	Philips	
U2, U3	MC1350 gain controlled RF amp	Motorola	
U4	SBL-1 double balanced diode mixer	Mini Circuits	
U 5	LM1458 dual op amp	National	
U 6	LM386 audio amp	National	
T 1	Toroidal xfmr: 85 μΗ primary, 45 μΗ secondary	Home-made	
T 2	Solenoidal xfmr: 0.82 µH primary, 1:1 tums ratio	Home-made	
ТЗ	Toroidal xfmr: 185 µH center-tapped primary, 20 µH secondary	Home-made	
T4	Toroidal xfmr: 86 μΗ primary, 150 μΗ secondary	Home-made	
Т6	10.7 MHz xfmr: 4.3 μΗ primary, 7:1 turns ratio	Toko 154AC- 470072NO	
L1	10 μH adjustable coil	Toko BTKANS- 9439HM	
X1, X2	10.91685 MHz crystals. Other closely matched crystals between 10.5 MHz and 11 MHz may be used.	Your choice	

Table 2. 20m parts list.

quirements affords greater leeway in design than would be appropriate for the radio, which must be all things to all people all the time. Here are some of the lessons learned:

- 1. Images. While a 455 kHz first IF is clearly an invitation for images when covering 1 MHz of RF, it's not the only concern. The AM receiver could have used a crystal filter, toowith two crystals, the response doesn't seem overly sharp.
- 2. Coils. Winding the home-made coils was not such an awful chore. The toroids are self-shielding (provided the leads are kept short), and can be wound to whatever configuration is needed in terms of taps, number of windings, and impedance transformation.
- Demodulator. Receivers using only one hybrid diode mixer should use it as the first mixer rather than squander its excellent characteristics as a demodulator.
- 4. Local oscillator. The NE602A's internal oscillator functioned quite well. It was sufficiently stable for SSB reception on 20 meters, and reduced the component count considerably over the separate oscillator/buffer used on 31 meters, where the stability requirements of AM are more lax anyway!
- 5. Mechanical. IF gain is sufficient in both receivers to be problematic. Even though this is not a construction article, those oft-repeated tips about RF mechanical layout cannot be overemphasized, in particular:
- a. Place bypass capacitors close to the chip.
 - b. Avoid sockets.
 - c. Surround the chip with as much

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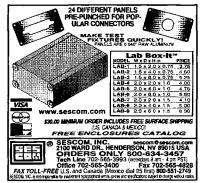
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PC board ground foil as possible.

d. While toroid transformers are self-shielding, the leads are not, so keep them short. Keep as much ground foil beneath solenoidal transformers as possible, connecting to the shield to ground, to minimize magnetic coupling between IF transformers.

6. Audio gain. Too much audio gain can be a bad thing. Power supply decoupling is more difficult at low audio frequencies than at RF. Make sure the low frequency response of the audio stage(s) (determined by coupling capacitors and filter components) is not too low. Motorboating—or even worse, subaudible oscillations that propagate to other stages—can result.

7. RF amplifier. Isn't needed at these frequencies using an NE602 front end. I experimented by removing Q4 from the 31 meter rig and connecting the tap, its base, directly to pin 1 of the mixer, with no difference in selectivity or image rejection. The other radio feeds the NE602 differentially, and this does seem worth the effort.

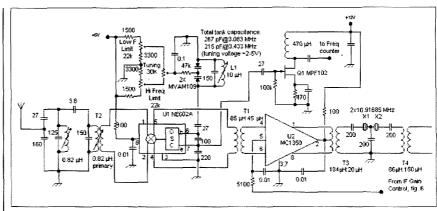


Fig. 5. 20m receiver mixer and 1st IF.

These two radios offered a testbed for experimentation and comparison, from which I learned much. And it's amazing how much more I now appreciate a shelf full of receiver design books!

Notes

1. A table of suitable values for this oscillator for frequencies between 3.3 and 26 MHz is provided on pages 30-11 and 30-12 of *The ARRL Handbook for Radio*

Amateurs, 1993, American Radio Relay League, Newington CT.

2. Low-pass first stage: Application note AN-20, *Linear Applications Handbook*, 1994, National Semiconductor Corporation, Santa Clara CA.

3. High-pass second stage: Rudolph H. Graf, *Encyclopedia of Electronic Circuits*, Volume 1. 1985, Tab Books, p. 296.

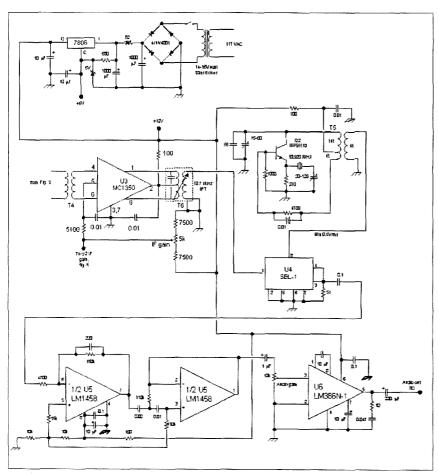


Fig. 6. 20m receiver 2nd IF, product detector, and audio section.

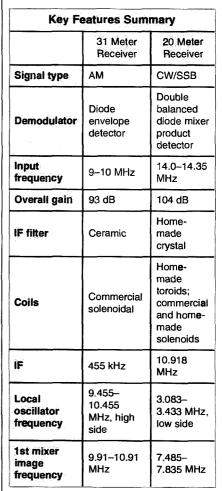


Table 3. Summary of key features.



QRP with the OHR 500

Missed out on building an HW-9? Here's the next best thing.

The pathway to my current Extra Class license has a huge gap in it. As an avid SWLer and wannabe ham, I suspended operations in 1961, without an amateur license, in order to chase girls, run track, score touchdowns, pursue academics (yes, I was one of those), and generally be a big man on campus. That was high school. Then came college, the '68 convention, investigative journalism, and kids, lots of them. About 34 years later, when the youngest of four children was safely on a path toward high school graduation, I bought myself a nice shortwave receiver. Thirteen months later, I had the Extra ticket and found myself on a dead run in the midst of ham radio, as if those three decades plus had never transpired.

ut I had, in fact, missed a few things. Like several solar cycles, some so hot that you didn't even have to turn the rig on to work Fiji - or so some hams have claimed.

I also missed the entire Heathkit era. Totally. I had built a Knight kit receiver way back when, but had never set any Heathkit parts aflame with a soldering iron.

When I returned to ham radio in 1995, I immediately fell under the questionable influence of a growing crowd of ham radio radicals - QRPers. I never went ORO, and haven't regretted it one bit. For one thing, I found that the QRP crowd was busy building their own rigs. There were even kits available. My first rig was an Oak Hills Research Sprint for 40 meters, purchased used off the Internet. I bought an MFJ tuner and some magnet wire from Radio Shack. A key, a set of earphones, and a battery, and I was on the air. Boy, was it fun.

From there, I bought and sold all sorts of used rigs — to catch up on those lost years — and then started building rigs.

What I truly missed was the chance to build any one of Heathkit's groundbreaking QRP rigs, the "hot water" 7, 8, or 9. I've used them and owned them, just by trading in the used gear market, but I was never able to build one of my own and then put it on the air.

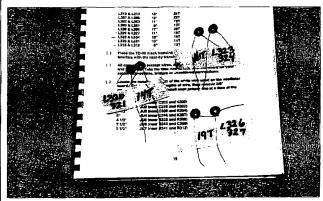
However, I have found the next best thing — the OHR 500 from Oak Hills Research — a five-band CW rig that just about makes you think you've put together your own HW-9. Other than the nostalgia value, the OHR 500 offers superior performance to even the stock HW-9, although it includes only one of the WARC bands - 30 meters. the key one, if you'll excuse the pun. The only other WARC band I'm interested in is 17 meters, for the DX, but believe me, the lack of that band is a

tiny price to pay for such a terrific radio. And a radio you get to build yourself, put your name on, and use to start racking up rag-chews. contest scores, or DX contacts.

The OHR 500 is the natural evolution of finely crafted kit rigs Research, founded in Michigan by Doug DeMaw W1FB, developed further by Dick Weitzke KE8KL, the designer of the OHR 500. The company is now owned by Colorado's own Marshall Emm N1FN/VK5FN, of Milestone Technologies, Inc., more well known as Morse Express. Some of the Oak Hills history includes a number of single-band rigs, the dual-band OHR ORP Classic, the 4-band OHR 400, and now the 5-band OHR 500.

The transmitter

The rig is rated to kick out a full gallon of QRP power: 4-5 watts on 80,



from Oak Hills | Photo A. Prewound toroids with labels.



Photo B. The OHR 500.

40, 30, and 20 meters and 3 watts on 15 meters. What it does is give you up to 7-8 watts on 80, 5-6 watts on 40, a solid 5 watts on 30 and 20, and the advertised 3 watts on 15. One thing we QRPers love is the ability to easily control power output. The OHR 500 places the power output control right where I want it — on the front panel - giving me continuous power setting control from zero to maximum output. With my matching Oak Hills WM-1 wattmeter, I can quickly adjust my power to QRPp levels. Coupled with the front-mounted Tune/Operate toggle switch, I can rapidly adjust power out when I switch bands. So if I want to operate in a contest, for example, at 250 mW or 950 mW for those power multipliers, I have no trouble resetting the output when 15 meters goes dead and I jump to 20 meters.

The QSK is smooth. And you can adjust both the volume and the tone of

the sidetone generator to match perfectly just how you want it to sound. Both of these adjustments are inside on one of the circuit boards.

The receiver

The receiver is a single superhet design with an RF preamp, a TUF-1

diode ring mixer, a selectable AGC circuit with a manual RF gain control, a four-pole crystal ladder filter. and a selectable four-pole audio filter. The VFO, which utilizes an air-variable capacitor (you old-timers should remember what that is), covers 150 kHz on each band. The funny noises that emanate from the receiver are sweet, melodic, and easy to copy. The superhet does a terrific job of suppressing everything but the signal you want to hear. Even the faintest CW signal is readable above the noise floor, which already has proven ideal for QRP contests when I am trying to dig out those barely audible signals - signals, incidentally, which I cannot hear on my TS-570 because its front end is so broad, and it is so noisy. This ability to dig the weakest signal out of the noise is one aspect of the OHR 500 that reminds me a bit of a Collins 75-S3 I once owned. While I admit the

comparison might be pushing it a bit. I can honestly say that the difference between the two is only slight.

For exceptionally noisy band conditions, the four-pole audio filter does kick the level of the CW signal up considerably by filtering out some of the QRN on either side of the signal. Also, the AGC

circuit does a fine job of equalizing the signals across the band. This feature is especially helpful during contests, when signal strength is all over the place. The AF gain and RF gain can be set high to capture weak signals, but your ears aren't pierced when you tune by a 30 over 9 signal. And for the pileups. congested contest band segments, and managing QRM, the RIT lets you move the receive signal plus or minus 1 kHz. Output jacks on the back of the rig provide options for headphones and an external speaker.

Construction preparation

Before taking inventory of the parts, I checked to see what sort of tools Oak Hills Research recommended for the OHR 500. All that's required are the basics: long-nosed pliers, a regular set of pliers, a good wire stripper, a medium Phillips screwdriver, a .062-inch Allen wrench, a smaller hammer, a 25-30 watt pencil soldering iron, a ruler, a magnifying glass, and a magnifying light. You'll also need a frequency counter that can read up to 30 MHz signals, a digital voltmeter, and a station transceiver for alignment. The kit comes with a plastic tweaking tool to adjust trimcaps and trimpots.

The manual suggests that a desoldering bulb and braid are "useful to have." Well, "useful" is an understatement. I'd say having some fresh, high-quality desoldering braid available is essential. I heated up a lot on this project. Don't get your desoldering braid at your local Radio Shack, unless there is no other way. There's no telling how long the stuff has hung on the rack, and there is a strong likelihood that the flux has dried out. I'm lucky enough to have the old TechAmerica store, now called RadioShack.com (essentially a Radio Shack store on steroids), within walking distance. They carry good, fresh desoldering braid. So check with your local electronic supply store or order some high-quality desoldering braid over the Internet. I also keep a flux pen handy to wipe onto a little strip of desoldering braid just before I use it. Also, once you have desoldered, clip off the braid section that contains the old solder, plus

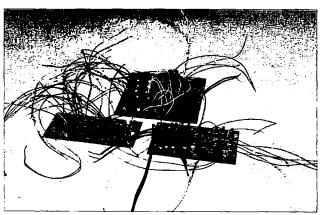


Photo C. The completed boards, ready for chassis assembly. Top: T/R board. Bottom left: Receiver board. Bottom right: Oscillator board.

another half-inch. The heat probably evaporated the flux in that extra halfinch. By cutting it off, your next desoldering move will be at peak efficiency.

Oak Hills recommends using rosin core solder with 60:40 tin:lead content for the kit. That's what I used, and nothing fell off the board afterward.

I start any project with a parts inventory. Every builder seems to have his or her own approach to this. One approach is to identify and label the parts and stick them all into Styrofoam. Another is to lay the parts out, side-byside, place a long piece of masking tape over them, then label the part on the masking tape. I've used variations on these approaches. What I often do now is to separate the parts by type and place them in plastic trays. These can be the trays that come with built-in compartments, the plastic trays that microwave dinners arrive in (wash them out first, though), or the plastic lids to pint containers. Then I take the most annoying parts piles - the resistors and capacitors - and sort them out by their values, arrange them neatly on the workbench and then place masking tape across their leads. Then I label them, and tape them up somewhere. There were no parts missing from the OHR 500 kit. And for the few times I thought I had a missing part, the culprit appeared after another search.

The manual

There are several nice features offered by the OHR 500 manual.

The instructions use a traditional step-by-step approach to construction, limiting you to stuffing no more than a half-dozen parts before you apply solder. A little bracket lets you check offeach step as you proceed. Just like my old Knight kit, and just like those fine Heathkits I never got to build.

The appendix includes a useful parts pictorial, so you can easily figure out what some of the parts look like. You'll also find good illustrations showing how the chassis and case are assembled, and where all the controls, switches, pots, and jacks go. Also included is a detailed board-by-board parts list, a comprehensive schematic, parts overlay

diagrams for each board, and a valuable, well-illustrated full page on how to wind the toroids.

Construction

I also like to get the toroids out of the way early, so I read ahead in the manual, sorted out all the cores and wires, and started winding. I usually cut the wire an inch or so longer than what is specified in the instructions. There are quite a few toroids to wind in the OHR 500, but I follow an approach suggested by fellow Colorado QRP Club member Jim Pope KGØPP. who wraps toroids while watching television, and doesn't worry too much about the winding count until later. I do the same now, and it works quite well. It's a great thing to do while watching a football game or some other form of enjoyment via the tube. I usually count the turns in groups of five. I'll place several objects nearby coins, a set of

keys, a pencil, etc. — and each time I finish five turns, I set one object into a little pile on the couch. If it's a 27-turn toroid, I quit after I have five objects in the pile, then add two turns and label the toroid with masking tape. I recount the turns under a magnifying glass. It makes life easier. The fingers get a little sore, though.

The three printed circuit boards that come with the kit are double-sided with plated-through holes - very solid. They include an oscillator board, receiver board, and the T/R board, which I assembled in that same order. Assembly is

routine from this point on. When explanation is required, such as how to prepare a piece of wire or how to align the bandswitching relays, it's included

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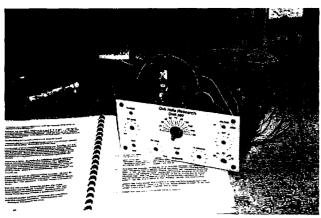


Photo D. Mounting the finished boards inside the box.

in the relevant installation step. The book does take you by the hand through the project quite nicely. I just followed the steps, inserting a few components into their respective holes, turning the board over, soldering, and then checking the solder joints with a magnifier.

Oak Hills recommends taking your time with this project, and I agree. You could build the rig in a long weekend, but you wouldn't want to go to work on Monday morning. Well, not that you want to go anyway. But you'd want to "not go" even more. I logged my time on this project, and found that it took me about 6 hours to build the oscillator board, 5 hours for the receiver board, 10 hours on the T/R board, 4 hours for chassis assembly, and 1.5 hours for alignment. Add to that about 3 hours for toroids, and I come up with 29.5 hours for the total construction project. Let's call it an even 30 hours.

One οſ the trickiest parts of the project is when you do the chassis assembly. What you have is three fully populated circuit boards with seemingly a million color coded wires sticking out of them. Well, the color-coding the key, along with a little patience. The sturdy

chassis design makes this work fairly simple. What you are doing in this stage is connecting the circuit boards to each other and to all the controls and jacks mounted on the front and rear of the rig.

Alignment

Once the chassis is assembled and all wired up, it's time for the first smoke test and then alignment.

The alignment procedures direct you to set the controls a certain way, and switch the rig to 15 meters. When you apply power to the rig for the first time, you should get a red LED on the front panel, and no smoke. At least that's what happened to me. Knock on wood.

Next, I attached my QRP wattmeter to the antenna connector and screwed on the Colorado QRP Club's kit-built dummy load onto the output connector on the back of the wattmeter. Then I attached my frequency counter to test

point number 2 on the oscillator board. I have a Radio Shack frequency counter, and all I do is use alligator clip leads to connect the counter to the test point.

Then it's just a matter of adjusting a trimcap for each band to read a specific frequency. There are

a few other tuning adjustments for each band.

In the next step, you adjust a pair of trimcaps for each band to obtain maximum power out. This is where I ran into trouble. I'll cover this a little further on

In the final alignment steps, you connect an antenna, tune in a CW signal, and then adjust one trimcap so you are hearing a 600-700 Hz tone — make sure you are on the high side of the CW signal. Then, using your station transceiver, set the transmit offset.

Finally, you adjust the pitch and volume of the sidetone.

And then — BAM! — you're on the air!

Well, not for me. Back when I was adjusting the transmitter for maximum power out, I simply wasn't getting it. I also wasn't hearing anything. After about a day's worth of troubleshooting, I packed up the rig, enclosed a check for \$75, and sent it off to the former Oak Hills owner. Dick Weitzke. who aligns the rigs under contract with the new owner of the company. Dick laid hands on my OHR 500 and sent it back with a nice little note. I had messed up the two transformers, and he found a solder bridge. Things like this happen, and I wasn't too bummed about it. Only three boo-boos out of so many possibilities.

On the air

I placed the OHR 500 on the air during a Monday night Spartan Sprint sponsored by the Adventure Radio Society. I knew there'd be plenty of QRPers messing around on a few bands to help out.

Well, one thing I noticed was that it seemed as though I was not getting heard too well. I'd call and call and call at the full five watts and get nothing back. I wasn't too used to this, even at QRPp power levels. I did manage to work Ed WE6W in California and Doc KØEVZ in North Dakota. But I had the nagging feeling that I wasn't right on frequency. That same evening,



Photo E. Wiring in the T/R board on the bottom of the chassis.

Continued on page 51

Read All About It!

Part 3 of good stuff from The Hertzian Herald.

Here's all you ever needed — or certainly wanted — to know about "Computers — What's going on in there?" Plus your added bonus this month: "2001: A brain odyssey."

ow do computers display dazzling video-game graphics, create 3-D views of a house from floor and elevation plans, or beat you at chess? What's going on in there?

Actually, a computer is just a machine for switching sets of voltages between 0 V and +4 V states. (We call them binary 0 and 1 states.) Any intelligence a computer appears to have is due to its incredible speed, and to the cleverness of the programmers, who are able to assign human meanings to intricate patterns of these binary digits.

How fast is a typical 300 MHz computer? Imagine a store clerk who takes 60 years to calculate your change if you give him a \$20 bill for a \$12.39 purchase. That's about how slow a human seems when compared to a computer. Such speed means, for example, that a computer can beat you at chess by checking *all* possible scenarios (most of which a human would consider grossly foolish) for ten moves ahead. This amounts to about ten billion

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scenarios, but checking them all and choosing the one that leads to a victory takes only a few minutes for a computer.

How can strings of binary 0s and 1s have any meaning in human terms? Actually, there are three basic ways. (We call them data types.) The digits can represent memory address numbers, computer instruction codes, or user data. Let's look at memory addresses first. (We'll get to the others later.)

Early 8-bit microprocessors, used in the Apple II, Commodore Pet, and TRS-80 computers, had an address bus consisting of 16 lines, and a data bus consisting of 8 lines. Such processors are still quite common in automobiles, microwave ovens, and sewing machines, to name a few examples. Let us say that the 16 address lines from the processor go to 16 corresponding lines on an IC memory chip.

The lines are numbered A0 through A15. Line A0 represents a count of ONE if it is at +4 V, or ZERO if it is at 0 V. Line A1 represents a group of 2 counts at +4 V, or zero at 0 V. A2 is for a group of 4, and A3 is for a group of 8. Continuing this doubling for each higher line, then if A15 is +4 V it represents a group of 32.768. All possible

counts from 0 to 65,535 can be represented by various 1 and 0 states of these 16 binary lines. Just for fun, see if you can find out what number is represented by 0001 0100 1010 0000. (It's a familiar number; answer appears later.)

What the processor spends most of its life doing is placing 16 binary digits on its address bus, which calls up one of the 65,536 locations in the memory. The memory then responds by placing 8 binary digits on its data bus, sending this stored data back to the processor.

Every now and then, the processor sends data TO memory, or it reads data from some input device, or it sends data to some output device. But mostly the processor sends a 16-bit address to memory and the memory responds by sending 8 bits of data to the processor; then the processor calls for the next byte of data at the next sequential memory address.

The computer is set up to treat the first byte of a program as an instruction or Op Code. The various 1 and 0 bits of the op code trigger various logic circuits in the computer. Here are some common operations that may be implemented:

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- Add two 8-bit numbers (or subtract hem).
- Clear the bits in the accumulator (the computer's main storage register) to zero.
- Increment (add 1 to) or decrement (subtract 1 from) the accumulator.
- Shift the bits in the accumulator one place left, multiplying the number by 2.
- Shift the bits right, effectively dividing the number by 2.
- Complement the bits Is become Os and Os become Is.
- Load the accumulator with 8 bits from a specified memory address.
- Store the 8 bits from the accumulator to a specified memory address.

In addition to telling the computer what operation to perform, the op-code bits tell the data type of the next byte (or several bytes). For instance, the opcode may tell the computer to load its accumulator from address 10101010 11110000. The program byte following the op code would be 10101010 (high half of address) and the next byte would be 11110000 (low half of address). It would take three successive bytes in program memory to complete that instruction — the first having the data type OP CODE and the next two having data type address. The fourth byte would then be the op code for the next instruction.

The above instruction is in absolute addressing mode (Motorola calls it extended addressing) because it tells in absolute terms (without reference to anything else) what address the computer is going to operate on. There is an addressing mode called relative where the address bytes tell the computer how far ahead or back to jump relative to the address it is already at. There is another mode, sometimes called register indirect, in which the address is held in a separate 16-bit register in the computer, which has been preloaded by another instruction. The exact addressing mode of each instruction, and hence the data types of the following program bytes, are determined by the bits of the op code.

Sometimes the op code tells the computer that the next byte is not an address where the data is to be found

OBJE		SOURCE	COMMENTS
ADDR	DTA	(\$ = Hex, # = Immediate Data)	
F800 F801	86 61	L D AA #\$61	Load Accum, immediate, with ASCII for *a*
F802 F803 F804	B7 40 00	STAA \$40 \$00	Send ASCII to printer at extended address \$4000
F805	4C	INCA	Next ASCII letter
F806 F807	81 7B	CMPA #\$7B	Finished letter "z"? (ASCII \$7A?)
F808 F809	26 F8	BNE back8	No (branch not equal) Send another letter
F80A F80B	27 FE	BEQ back2	Yes (branch if equal) Halt right here

Table 1. Sample program segment.

— the next byte IS the data. This is called immediate addressing, because the data follows immediately after the op code.

Sometimes no address needs to be given for the data to be operated on because the data is already in the computer's accumulator. Clear Accumulator or Increment Accumulator are examples. This is called inherent addressing, because the instruction is inherently complete in one byte. The following byte is the next instruction.

So, the bits on the data bus can represent op codes, addresses, or data.

You must understand that there is nothing about the bits themselves that distinguishes them as instructions, op codes, or data; it is their relative position in the program that determines how they will be interpreted. For example,

the Motorola 6800 microprocessor will interpret the same byte (say, 1001 0110) as instruction Load Accumulator if it appears first in the program, as Low Half of Address 0000 0000 1001 0110 if it appears as the second byte after the Load instruction, and as User Data if it appears at the specified address to load from, 0000 0000 1001 0110.

The computer itself makes no attempt to interpret user data; that is up to the programmer. For example, if the programmer sends data 1001 0110 to a printer that uses ASCII (American Standard Code for Information Interchange), the data will denote a capital letter V. If the programmer has been using that data byte to count parts loaded into a box, it will denote 150 parts. If the programmer is checking security on a building with 8 doors, data 1001 0110 will indicate that 4 of the doors are open (0s) and 4 are closed (1s).

Now, let's look at a typical program segment (**Table 1**) for a 6800 microprocessor. To avoid a confusing blizzard of 1s and 0s, the binary is converted to hex (hexadecimal): Each hex character represents four binary digits, as shown in **Table 2**.

The source code, on the right, is what the programmer writes. The object code, on the left, is what the computer executes. A "host" computer automatically translates the source code to object code. FE and F8 are "two's complement" for -8 and -2, respectively. Any digital book from the library will tell you about it.

Our program is 12 bytes long. Real-

Hex	Binary	Hex	Binary
0	0000	8	1000
1	0001	9	1001
2	0010	Α	1010
3	0011	В	1011
4	0100	С	1100
5	0101	D	1101
6	0110	E	1110
7	0111	F	1111

Table 2. Binary to hex conversion.

world programs tend to be 10 kilobytes to 10 megabytes long, but they look exactly like our tiny one. This is just an example to give you a feel for computer programs, but if you have questions, write or E-mail me.

2001: A brain odyssey

Next year will be 2001. Are talking, thinking, plotting computers like HAL in the movie 2001 just over the horizon? I don't think so. If you have been following our discussion, you know that computers function by manipulating binary bits, and that meaning is assigned to those bits by programmers. The instructions are things like Load, Increment, Branch If Equal, and Add. Pentium-level computers work on 32 bits at a time rather than 8, and they have multiply and divide instructions, which some people find impressive but there are no instructions like "seek and destroy enemy aliens."

Futurists often assert or imply that when the number of bits in a computer memory reaches the number of cells in a human brain, the computer will begin to think like a human brain. Comparing the computer to a brain seems reasonable at first because they both have the ability to store and process information. However, this is rather like comparing meteorites to bulldozers because they both make big holes in the ground. The question is not whether a computer is like a brain, but whether a brain is at all like a computer. Having designed them, we know everything about computers. We know almost nothing about the brain.

It was once thought that the brain was a binary device: a neuron either fired or remained inactive. It now appears that neurons fire in different ways at different times, and that the differences may reflect different informational content. Thus we are unable to say that the brain is like a computer even in the elementary classification as digital or analog. The other questions we ask when comparing computers are totally meaningless when applied to the brain: What's the word length? What's the clock cycle time? Is there a signed-number divide instruction? How many primary accumulators?

A striking feature of the brain compared to a computer is its ability to handle analog data in the presence of deafening background noise. For example, most of us could pick Mom's face out of the 30 faces in her eighthgrade graduation photo. A computer would be doing well to count the number of faces correctly, and probably couldn't tell which were boys and which were girls. The overwhelming superiority of the brain in this area. and the equally impressive superiority of the computers in mathematical and textual manipulations, suggests that these two devices may be operating in fundamentally different ways.

The big question is. What are computers capable of doing, and what can they not do? But computers just manipulate binary bits: 1 MHz or 400 MHz. 8 at a time or 32 at a time, that's all they can do. The question is thus better phrased. What can a computer program be written to do? This makes it clear that the answer to the first question depends on the programmers — humans — more than it depends on the computer hardware.

A computer does not have — and there is no reason to suppose that it will ever acquire — a will or a sense of purpose. A computer will execute a program to trigger a charge that will blow it to Hades with the same indifference that it will calculate the square root of six. Computers do only what we humans program them to do. Thus, it may be wisest to frame the question as, What do we want to have our computers do? This makes it clear that the answer to all three questions — and the responsibility — rests with us.

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Wattmeter Winner

73 reviews LDG's DWM-4 digital wattmeter kit.

This is a microprocessor-controlled unit that covers the HF (1.8 to 54 MHz, up to 150 watts), VHF (140 to 160, up to 150 watts) and UHF (420 to 470, up to 150 watts) bands. It uses a system approach to monitor both power output and SWR for up to four rigs in any combinations of bands. The system consists of a main unit with the microprocessor, and then a sensor unit that hangs off each rig you want to monitor.

Loome up with a winning kit. The design for this digital wattmeter was first published in a July 1999 *QST* article, and the new LDG kit is based on that design. My system has the main unit, one sensor for HF, and one for VHF.

The display unit has a 2-by-16 backlit LCD module. This display provides you with information about the RF that the remote sensors are sampling. Using the display and the Menu and Select push-buttons allows you to control which sensor monitors which band and whether you want the display to be a bar graph or numeric

output. You can look at the forward and reverse power and the SWR simultaneously.

The DWM-4 can operate with from 11 to 15 VDC at minimum of 75 mA. The correct power plug is provided with the kit. The manual states that any 50-ohm cable can be used to connect the remote sensor to your antenna system. SO-239 connectors are used in the back of the sensors for cable connections. You may need an adapter for the 2 meter module if you are using BNC connectors.

The kit is at the very top of my list with regard to quality of parts. The hoard is a work of art. It is very clearly

> silk-screened and the parts holes are in the exact location so that when you place the part on the board, it fits perfectly. The board is platedthrough and solder-masked. The solder masking is also at the very top of my list for being well thought out. The solder

pads are very small, but allow easy soldering. This solder masking makes it very hard to end up with a solder bridge. The manual is also very well done. It is clear and easy to follow. There are step-by-step instructions, and you check off each step as you complete it. The manual has you install parts by how far they stand off the board. I really like this approach. It makes it much easier to get the parts flat against the board and have the project look nice when you have completed it.

I would rank this kit as easy to build. There are not all that many parts. The board is not very densely packed, and the silk-screen and directions are both clear. The parts come in separate packages. I found no need to separate out resistors and such before building. There are only a few values of each.

You will need to use an ohmmeter for the resistors. The resistors are 1/8 watt and that makes it very hard to check the color code at my age, even with my magnifying glasses on. It is also easier to take an extra minute to check rather than have to desolder parts later.

There is no external wiring. The jacks solder right onto the board. There are prebuilt ribbon connectors to

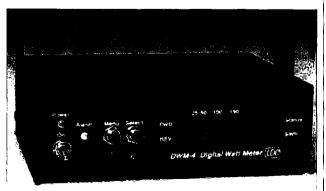


Photo A. Front view.

connect the display and the controls. Even the switch and push-buttons plug into a board, and you just solder them to the board after they are installed in the case. This also makes the kit much easier to build, and saves a time at the end of the project. There is one toroid to wind for the HF sensor. The LCD board comes pre-assembled. I will repeat the fact that this is a very easy kit to build successfully.

The kit went together in about 2-3 hours as advertised. I have to admit I never clock building a kit. There were absolutely no surprises. The kit went together easily and was a pleasure to build.

The instructions have you build your sensors before powering on the main unit. I ended up taking a break between the main unit and the two sensors. I like to know that what I have built works correctly before going on to other steps. I connected 12 volts to the main unit and turned the power switch on. I expected some lights and such to start flashing or some other indication that there was life in the unit. No smoke, but no visible means of determining whether the project was up and running.

Next. I took drastic measures. I pulled out the manual and actually read it. Right there in plain sight, in straight English, it said I needed to adjust R25 on the main board to get the LCD level correct. About another 15 seconds later, the unit was doing everything it was supposed to at this point. The same thing happened with

the HF sensor. You would think I had learned my lesson. No indication it was working until I read the instructions and adjusted the unit's balancing capacitor. All in all, everything worked 100% as designed, first time up.

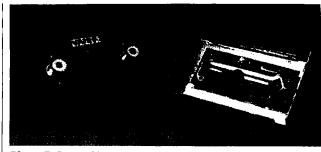


Photo C. Sensor kit.

Calibration of the main unit involves using a known 100 watt output signal and a 1:1 dummy load. There are two variable resistors for each of the four possible sensor positions. You feed it 100 watts forward and adjust the digital output to read 100 watts. Next you reverse the mini-stereo jack leads and do the same thing for the reverse reading. The manual suggests borrowing a very exact meter and using it for reference. I plan on doing this very soon.

The functions of the meter are accessible by using the menu and select push-buttons. There are a total of seven menus. When powered up, the unit displays the model of the kit and the software version and then goes to the main menu.

Pushing the menu button cycles through the seven menu choices, and the select button is used to select individual menu options. This is intuitive and it should only take a couple of minutes to get things set up to your preferences. Pressing the select button cycles through the four channels and then to A.

The A is for automatic operation. In this mode, the display automatically switches to the channel that is currently sensing forward power. If two channels both have forward power, the smallest channel number gets priority. You can have either bar or numeric readout. You also can set the HF at either high or low power output levels.

The Alarm threshold allows you to select the SWR reading at which the yellow LED comes on. There is also a separate Relay threshold. This controls an internal relay that can take the power out of line if the SWR goes past a set point. You can also set whether you want the relay to automatically reset or manually reset.

There is also built-in error checking. One type of error reading will come up if the forward maximum power level is exceeded. A second error is displayed if the reverse maximum

Continued on page 53

Specifications

Board size	3.5 x 4.0 inches
Enclosure	6.0 x 4.0 x 2.0 inches
Sensor size	4.0 x 2.0 x 1.5 inches
Sensor connections	SO-239
HF power ranges	15, 150 watts
VHF/UHF power range	150 watts
Power requirement	11 to 14 volts DC, 75 mA

Measures peak or average

Bar or numeric readout

LED and relay variable alarm system, 1:1 to 30:1

Built-in error-checking software upgradable

Kit builds in 2 to 3 hours average

Table 1. Specifications.

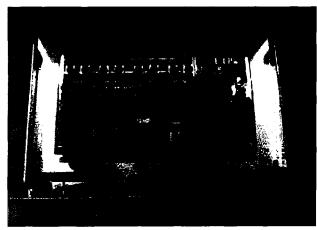


Photo B. Inside view.

Revenge of the Hams

As our restructured hamdom now sets out to do continued battle for survival and growth in the e-business of the New Economy, it's sometimes easy to forget that the Intels, Ciscos, and Microsofts of the digital world have not been the only sources of technological innovation and application during the past few decades.

uch to our benefit, a number of ham Lmanufacturers have not been slow in embracing the new technologies in ways that are as striking as they are revolutionary, and it is these types of advances that will help us most in attracting new members to the ham ranks. So our 73 hat is off not just to the Alinco-Hamtronics-Icom-Kachina-Kenwood-MFJ-Yaesu techie pioneers, but also to the many small and medium-size ham manufacturers who are also keeping up with the computer Joneses and then some.

On this month's cover, supplied by Kenwood, we see a good example of just how far things have come — and how ham technology continues to progress.

Although the TS-520S dates back to 1975, you will still hear many of them on the air today — a sure tribute to a versatile design. Designed when digital displays were not available on HF rigs, this is a rock-solid rig whose optional VFO for split operation makes it a favorite of contestors.

Still, Great Grandfather 520 pales in comparison to Great Grandson 570, Kenwood's new TS-570D(G) transceiver. This state-ofthe-art rig features 16-bit AF-stage DSP, the NR1 noise reduction system, TX audio shaping, CW autotune, large LCD display, 46 types of menu features, heavy-duty transmitter section, a bank of 100 memories, PC control option, and — of course — much. much more. Ready to transmit on the 160-10 meter amateur bands and receive at 500 kHz to 30 MHz, the TS-570D(G) measures a scant 10-5/8"W x 3-3/4"H x 10-11/16"D, making it ideal for shack, car, RV, or boat.

Why not visit your favorite ham manufacturer or dealer today - in person or otherwise — and part with some of your hard-earned New Economy cash? Keep

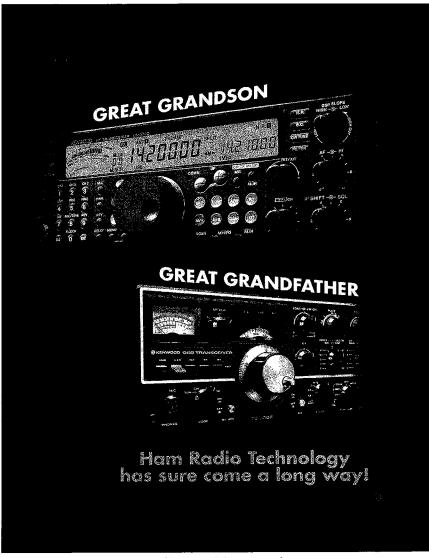


Photo A. Kenwood's Great Grandfather and Great Grandson.

active or get active again with a new rig, and don't forget to show off its techno-

logical whizbangs to the kids down the block.

NEVER SAY DIE continued from page 4

Clubs

How lively is your ham club? How much fun are the meetings?

Running a ham club is an exercise in show biz. Heck, that holds for any club. If you make the meetings fun, they'll come.

My first experience with this was when I was elected president of my college ham club (W2SZ). At the time we had about eight members coming to meetings. A year later I had over 400 active members! Show biz.

When I bought my first Porsche, I went to the Porsche Club of America meetings and snored through the technical discussions. I suggested we get some action going and was quickly elected president. I kept 'em busy with club rallies and gymkhanas, and organized yearly factory visits to Stuttgart, where we picked up new Porsches and got to drive them under the supervision of the Porsche factory racing team on the famed Solitude race track. The membership soared, and we all had a ball.

Then I moved to a sleepy little New Hampshire town, where I joined the Chamber of Commerce. Big deal, we had about ten active members. With some show biz, as president I pepped up the meetings. I had the governor, the president of a local college, and some political candidates come to talk. I had representatives of the local banks at a roundtable fighting with each other for our business. The membership went to nearly two hundred in a year.

If you want your ham club to be fun and grow, you've got to have exciting meetings, and that means interesting speakers. It also means keeping almost all of the club business within the executive committee, with a very brief committee report at the regular meetings. It means getting meetings going on time and starting 'em with your speaker.

I've addressed hundreds of ham clubs over the years, and far too many bore the hell out of their members with club business discussions, the election of officers, and so on, having them yawning and fidgety by the time the speaker is introduced.

Okay, where do you get interesting speakers? Take a look at the ads in the ham rags. Are there any ham manufacturers or dealers within driving distance? How about hams who are into some special ham activity such as fox hunting, DXing, ham satellites, packet, RTTY, slow scan, and so on? Maybe even some show and tell on QRP?

If your club is in the boondocks, then how about getting the ham manufacturers to do a video talk for you? I've done that for some clubs and even have given keynote talks for computer conferences where they didn't want to pay my travel costs. Wouldn't your club members be interested in seeing a video by the top gun at Icom, Yaesu, Kenwood, Ten-Tec, Kachina, and so on showing and talking about their latest creation? You bet they

> would! I know I'd drive an hour to a ham club meeting if something like that was on the menu. And with today's digital video cameras and computer editing systems, it's easy for manufacturers to put together a very professional video presentation. I'm using the iMacDV and a Sony 310. Fab!

For that matter, how about doing some club videos you can swap with other clubs? Many years ago the Philadelphia Philmont Mobile Club used to do movies of their fox hunts, I still remember some of their epics. So get busy and do some videos of your club Field Day effort. Or how about a VHF contest special, where the club sets up on a mountain and has a ball? Get your little gray cells into action and get busy. The more club activities you can get going, the more members you'll attract.

Whither Ham Radio

It's about time to come to grips with the reality of amateur radio today, something I haven't seen recognized by the ARRL or, for that matter, in any of the ham club newsletters. Or CQ, etc.

When I got involved with amateur radio, back in the mid-1930s, the hobby was in flux. The battle over spark (Spark Forever!) had just ended, with spark being made illegal. The first commercially made receivers from National Radio and Hallicrafters had instantly stopped hams from building their own receivers, but we still had to build our transmitters. Most of our transmitters were ultrasimple: a crystal oscillator and an amplifier tube. Around 95% of all ham communications were via CW, with a handful of Class A ops in the 100 kHz phone segments on 75 and 20m. Class B phone ops were almost totally on 160m, as 10m was an as yet unexplored VHF band.

Then came WWII and four years of ORT, followed by tons of US Army war surplus. (And almost no Navy surplus, since the Navy routinely destroyed their used and unneeded new equipment. When a bunch of new construction contracts for submarines were canceled right after the war I watched millions of dollars of fabulous radio, radar, sonar, and fine test equipment which had been set aside for the boats being crushed at New London.) Most of the surplus was easily converted for ham use. This was soon followed by commercially made ham transmitters, effectively stopping 95% of us from having to build anything. The day of the "Appliance Operator" had arrived. And, for all practical purposes, the need for even the slightest understanding of electricity or electronics. Most of us bought a transceiver, an antenna, and talked.

I got involved more for the fun of building equipment than operating. I built hi-fi amplifiers, an all-band kilowatt rig, a complete RTTY system, and so on. I spent years at my workbench building and converting surplus. I was the first ham in New York City on 6m, I DXed on 2m from the top of The Daily News building, and so on. When SSB came along, I quickly built an SSB rig.

Then, in 1965, when I saw that transistors had essentially ended the era of ham building, I held an auction and got rid of several truckloads of parts, tubes, and surplus equipment. And that was the end of my building.

Today there are so few hams building equipment of any kind that getting articles for 73 on simple projects is nearing the impossible. Sure, hams like to read about construction, but that's ham fiction for most of us.

The reality of hamming today is that, as I said, we buy everything, plug it in, and talk.

From that point of view, the ARRL's recent defense of the Morse Code just shows how totally out of touch with reality the guys you've elected as directors were.

The 21st Century

Okay, I've been talking about ham radio circa the 1990s. But now we've got to face the reality of the Internet, something we've been avoiding. Now we have rigs such as the Kachina, which can easily be adapted to be

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operated from anywhere in the world via the Internet, complete with tuning the receiver and turning a beam remotely. What are the ramifications of this turn of technological events? Repeaters are being integrated with the Web, which raises a question. What can we do to keep any unlicensed Web surfer from accessing a repeater and making ham contacts? Or do we need to? What are the downsides and upsides?

How long is it going to be before we start seeing Web interfacing units advertised in our ham rags?

Keith Lamonica W7DXX recently set up his Kachina rig with Internet access. The first contact was made by a Hong Kong ham! Keith is busy putting up a tower and beam, adding a pair of shoes, and getting the bugs out of the software.

True-blue hams blanch at the horror of nonlicensees accessing our repeaters or getting on the air via a Web-controlled HF rig. Hmm, so what, today, is the difference between an ordinary web surfer and a ham? It's that test the VECs are administrating.

I've got a semisecret for you. When I got my ham ticket over 60 years ago, I memorized the ARRL Q&A Manual and I didn't know diddly about electronics. Oh, I could build a ham rig from an article in Radio, but if anything didn't work I was on my way to see Cy W2IXY, just as about every other ham in Brooklyn (NY) did when their rigs didn't work. It wasn't until the Navy put me through a nine-month course in electronics that I really understood what was going on.

With today's equipment, when something goes wrong, we just send it to the importer for repairs. I no longer have the test equipment it takes to service one of today's ham rigs. And never mind trying to get into an HT! Lordy!

And 99% of you are in the same leaky boat. You buy, you operate, and that's it. Okay, then, just what value is there in our passing the VEC tests? They're memorization, pure and simple.

It's no wonder that in 1963, when the ARRL petitioned the FCC to make almost every ham go to the FCC offices to pass their tests again, that tens of thousands panicked and sold their ham gear for pennies on the dollar, putting every major manufacturer and almost 90% of the ham dealers out of business, all within a year or two.

Today, in 2000, the situation hasn't improved. The 1963 ham disaster closed down over 90% of the school ham clubs, shutting youngsters out of the hobby. And that, in turn, stifled ham innovation and pioneering which has always been mainly done by youngsters.

Jack Babkes W2GDG was 25 when he developed narrowband FM. I lived just a few blocks from him, so I quickly (age 23) started pioneering this new mode. The developer of SSB was a youngster, ditto Copthorne McDonald and his slow scan.

Our serious lack of young hams since the ARRL purge, I suspect, explains why amateur radio has contributed so little to the advancement of the art (one of the major reasons for the FCC authorizing the hobby) in recent years.

Today, the average age of our General-Advanced-Extra hams is in the 60s. And in the minority, with 57% of licensees being Novices or Techs. These so-called entry-level license classes now dominate the hobby.

I'd like your take on where amateur radio will be going during the next few years. Obviously we're going to have to in many ways integrate with the Internet. So, let's be realistic about this so we can plan, rather than let nature take its course. Get busy with your word processor and pepper me with disks and hard copy of your proposals for our future.

In the meanwhile I'll be looking for articles on Internet interfacing, and reviews of new ham gear. We all want to know what you think of your new rig (or whatever).

Y2K Fallout

Was the Y2K bug a \$600 billion fiasco? Nope, even though we didn't feel a wrinkle, the problem resulted in tens of thousands (millions?) of computer systems being upgraded and updated worldwide. It held a lot of hands in the fire, forcing badly needed upgrades to no longer be put off.

Well, you've read about what terrible shape many of the government computer systems were in. Many were relics of the '50s and '60s, with more patches than an Okie tire. With the Y2K bug about to trash these obsolete systems, and with no practical way to add still more patches, many bureaus gave up and started fresh. It was a long overdue expense, but now it's paying off in better information systems for thousands of companies.

Those Pileups

The ARRL's long-term goal of keeping QRM down on our DX bands via their Morse Code barrier must have the directors jumping gleefully these days. Never has the DX been rolling in better. Never have there been so few American hams chasing DX. I can remember DX pileups on 20m with hundreds of stations all fighting to get through. Heck, I've been on the other end of some of those in my operating from Jordan, Navassa, Nepal, and a few dozen other weird places. But, if you listen today, you can hear one- and twostation pileups, even on some of the rarest DX. You don't need a kilowatt and a big beam to break through these days - all it takes is 50 watts and a dipole.

Now, thanks to the FCC finally thumbing its nose at the League, we'll be seeing some growth in HF operating. The DX is out there by the ton — go get it!

URL News

My thanks to Randy Frum for pointing out an oversight in my column last month. On page 62, under Micro Web Server, the correct URL should have been [www-ccs.cs.umass.edu/~shri/iPic. html]. Note the hyphen after www.

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You're So Vain

You probably think this article is about you.

Alright! So you've finally got your new vanity callsign, and you've shown it off on the air. Now, how about showing it off to the rest of the world!? One way you can do this is with a vanity license plate for your car or vehicle. With apologies to Carly Simon for the title, here's how you can be so vain ...

anity plates have been around for quite some time. I've had mine for years now. You have probably seen these types of plates on the road. They are usually a maximum of 6–8 characters and/or numbers, and spell out something on the plate. The word(s) usually have some special meaning to the owner of the plate. Some are simple words like someone's first name or perhaps a word like BI-

NARY, which would have special meaning to a computer programmer. Others like 2M8OS ("tomatoes") have to be more creative because of the limited number of characters. (Imagine someone trying to figure out what your callsign means in English!)

Ham callsigns on a vanity plate make sense because they have the right number of characters and since they mean something not only to the ham

who owns it, but to other hams as well. More properly, though, ham calls belong on a specialty plate (described below).

It would be nice if I could just show you a uniform method for obtaining your own plate. Unfortunately, each state has its own setup for issuing plates, and they vary enough that with the limited space of this ar-

ticle I couldn't cover all the details of every state. Besides, Web sites like [http://bookworm.sdsu.edu/plates.html] already give you some of the basic information by state. If you want a plate, you're going to have to do a little investigating on your own, but this article will point out a couple of things to look out for.

First, you've got to determine if your state allows custom plates or not. A good place to start is on the Internet. Try [http://www.state.xx.us/] as a starting point. Just substitute your 2-letter state abbreviation in for the "xx." For example, Pennsylvania's state page is at [http://www.state.pa.us/]. You could also just try looking up your state's Department of Transportation (or Department of Motor Vehicles) telephone number in the phone book.

Once you determine that vanity plates are indeed available to you, you need to look at the options. In some cases, there are actually a couple of different types of plates to choose from, and there are many terms for these plates. Some of the various names are: vanity plates, special plates, specialty plates, personalized plates, special fund license plates, and so on.



Photo A. Here you see my plate (AC3L) and my wife's plate (OK4U). At first glance, you might think that she is an amateur too, but if you look a little more closely, you'll see that hers has a different meaning. My wife was always telling me, "Okay for you, Ed," and I think that, for a while, it was her favorite saying. So much so that I suggested she get the plate.

Be sure to check the definition and requirements for each type of plate available to you. For example, your state may define a vanity plate as having 1-3 numbers only, or perhaps 3-7 letters only. In that case, you would not be allowed to have a ham call on it. On the other hand, many states' personalized license plates allow both letters and numbers.

Note that you may still not be allowed to put a ham call on a personalized license plate if your state provides for a specialty-type plate for amateur radio.

Specialty plates have a special graphic or otherwise a special "look" to them to set them apart from the normal state license plate. Special plates exist for everything from zoos to drug abuse resistance education (D.A.R.E.) to wildlife preservation.

Many states have provided a special type of plate reserved just for amateur radio operators. This specialty class of plate is often referred to as the "call letter," "ham radio," or "amateur radio" plate.

Next, you need to be aware of any requirements you may have to meet before applying for a specialty plate. You may have to keep emergency amateur radio equipment in the car, or you may just have to show proof of a valid FCC license. On the other hand, you may just have to provide a fee to obtain your plate. As for applying for your plate, some states do allow you to apply on-line, but others, due to various paperwork needs, require you to mail in your application.

As with most things in life, there are both advantages and disadvantages to having an amateur plate. On the downside, there is the possibility that it just might help some thief know where they can find radios to steal. On the plus side, there are the small things like how it helps other hams you've talked to (but have never met) recognize you at hamfests. And there are the important things like emergency situations in which it can help others, who may be in need of emergency radio communications, to find the help they need, or may gain you access to an emergency scene where you are needed.

A closing note: While researching vanity plates, I came across an interesting advantage that I hadn't thought of. License plate collecting makes an interesting hobby for some. And perhaps it could even be a profitable one. I found one page with a personalized plate that had an asking price of \$25,000 (see Table 1). Who knows? Someday, maybe your plate will be worth that much, too! 23

URL (http://)	Destination
cache.cow.net/~friedman/dmv.html	Departments of Motor Vehicles links
www.sos.state.il.us/depts/vehicles/pers.html	Illinois state personalized plates page
www.oktax.state.ok.us/oktax/licperm.html	Oklahoma amateur radio plate information
www.arri.org/fieid/regulations/local/plates.html	ARRL amateur license plate fees page
www.co.honoiuiu.hi.us/ocda/hampl.htm	Oahu Civil Defense Agency amateur radio license plates page
members.tripod.com/scottk1/phgLinks.html	License plate links
www.domainmart.com/book/4saler.htm	A \$25,000 plate?
iistings.ebay.com/aw/listings/newtoday/ category421/index.html	License plates being auctioned
www-chaos.umd.edu/misc/origplates.html	Vanity plates and what they mean

Table 1. Here are just a few of the interesting sites I found regarding specialized license plates.



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Another Look at the NW-40

EMTECH's QRP transceiver kit proves a winner.

Author's note: EMTECH kits were designed by Roy W6EMT. He passed away shortly after I built this kit two summers ago. His energy and enthusiasm will be missed. The EMTECH product line is now owned by his son Scott KC7MAS, who is carrying on the fine tradition.

had a longing to return to low power CW and to build something. I searched the magazine ads and the Internet looking for a QRP transceiver kit that covered the complete 40 meter CW segment and had enough audio to drive a speaker. I didn't want to cover just a small segment of the band and I wanted the transceiver to have a large dial so that I could easily read the frequency. In addition, I had plans to use the transceiver during Field Day on natural power, so low receive current consumption was also on my spec list. I reviewed the data on all the available rigs, and placed an order for an EMTECH NW-40.

The EMTECH kit arrived and I spread it out on the kitchen table — which is always the first inspection process for any product that I order. My wife eyed the unpacking process. I distributed numerous small plastic bags of parts all over the table. She finally spoke: "All right, I give up, what are you doing?"

"I'm looking at this kit."

"What kind of kit is it, is it a Heathkit?"

I love my wife. She has the memory of an elephant, and she remembers the many Heathkits that were assembled on kitchen tables in the past, mostly in apartments and military housing.

> "No dear, Heathkit is out of the kit business, but this kit by EMTECH reminds me of Heathkit."

I grabbed the manual; if the manual looks good then the kit stays. It had the usual schematic and board layout, including both sides of the board. Ah, a nice page devoted to

parts identification explaining what those little mystery numbers mean on the capacitors and other goodies. The final assembly page had a nice pictorial with a drawing of the various controls, jacks, and final assembly wiring, which was point to point. This page really looked good — just follow the picture and hook up the wires. Hidden in the back of the manual were two pages of resistance and voltage charts for troubleshooting if needed.

The most unique thing about the manual and the kit is the organization. The manual is divided into logical, organized sections that make sense. When you finish building a stage, you actually power up the stage you just built and test it before continuing on with the construction of the remaining stages. Believe me, this is the way to go. This is a much easier process for construction than building the whole thing and doing the famous "smoke test." Now I knew the reason for all the large number of plastic bags of parts. These were the "stage" bags - you build the kit bag by bag or stage by stage. Anyway, the manual looks good and the kit has passed the kitchen table inspection stage with flying colors.

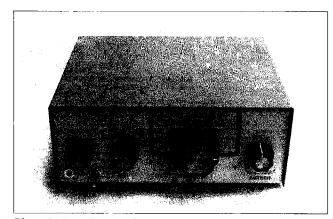


Photo A. Outside view of EMTECH NW-40. **38** 73 Amateur Radio Today • May 2000

Continuing with my screening of the kit, I picked up the circuit board. What got my immediate attention was the wide circuit traces. Wide traces are important if you make a mistake with a parts location and have to unsolder the part. In some instances, when you make a mistake and try to unsolder the part, the heat can cause a small printed circuit trace to lift right off of the board.

If you do make a mistake during assembly and have to remove a part, then use desoldering braid to suck the solder out of the parts hole. The braid is sold at Radio Shack and has a part number of 64-2090.

I commented on the wide traces to Roy W6EMT and he answered that he did "PCB design for years, and his boss liked wide traces." All I can say is that if you have a choice, then wider is better for beginning kit construction. The board has an easy-to-read silkscreened outline of all the parts to help you with the placement, so just use the manual and plug in the parts — it's easy.

After the initial inspection and familiarization, I continued with the construction. No one likes to wind coils, so the instruction manual starts you off by having you wind all the coils needed for assembly so that you can have them ready when you need them. Most of the coils are on small, donut-shaped high Q toroids, so the coil winding process is not too tedious. The final amplifier circuit coil, L-5, requires two windings. This is kind of confusing, but EMTECH has supplied color-coded wires to help you keep track of them.

As per the manual, I started on the VFO (variable frequency oscillator) section first. This is a pretty large step for starting a kit, keeping in mind that you are going to check out each stage as you build it. I guess EMTECH figured that if you are going to have a problem, it most likely will be in the VFO. Grabbing the bag marked VFO, I did an inventory of the parts. This is very important, because it helps you identify and locate the parts for each step and will speed up the actual assembly process.

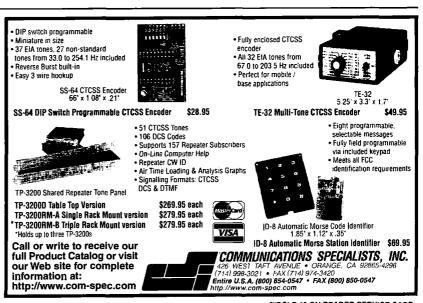
During the identification of the parts of the kit, you have to refer to a "Bands Table." The manual covers kits for four amateur bands; some of the parts are different for each band.

I started stuffing the board with the VFO parts, and I noticed that the holes drilled through the board were very precise. The parts were easy to fit in the holes, and there was no forcing of parts through the board. The VFO went together in about an hour, and I was ready for testing. You will need either an allband receiver or a frequency counter for testing and calibration, as the VFO on the forty meter version operates on a frequency of 4.800 MHz to 5.000 MHz. The IF frequency of the transceiver is 12 MHz, so that when you receive a 40 meter frequency of 7.000 MHz, it mixes with the VFO frequency of 5.000 MHz and produces the IF frequency of 12 MHz.

As you tune the transceiver dial higher in frequency, the VFO actually goes lower in frequency. As per the instructions, I adjusted the turns on LI by spreading and squeezing them to get the VFO to fall within the specified range. I played with the large air variable and was impressed with its builtin ratio tuning; you have to turn the shaft of the air variable several times to cover the complete range, providing very good coverage. The tuning capacitor is a hefty, solid unit and mounts on the board to provide a rugged, stable assembly. Conducting a preliminary test, I banged the assembled VFO board around on the bench while listening to the signal on 4.950 MHz. The output signal was very steady and shifted very little.

Encouraged by the VFO, I went on to build the keying and antenna switching circuit. The keying system is all solid state and there are no relays. The antenna switching circuit is switched by diodes. A look at the schematic showed it to be really well engineered, with no exotic pin diodes. As I was building the keying circuit and other stages, I noticed that I kept putting in bypass capacitors everywhere - great, you can't have enough for a stable system. When it came time to check out these circuits, I had a problem. I had forgotten to put in jumper J4. In the instruction book, the keyer parts list has two columns, so be sure to read the second column, which in this case only had one item: jumper J4. Overall, the checkout was very easy and only required a VOM. I looked at the keying on the scope, and it produced a nice square wave pattern.

Next were the RIT circuit and the audio amplifier. Testing the RIT on the bench resulted in a very stable circuit. Testing the audio circuit was easy. You can use some kind of audio generator, or try a secondary method contained in



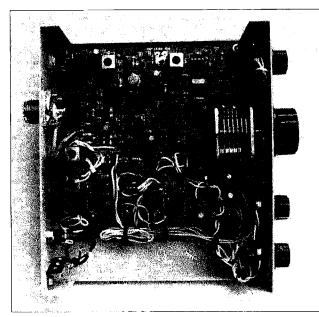


Photo B. Inside view showing PC board assembly.

the manual. This is just to "touch the pot connections with your finger, you should hear a hum." Ah, reminds me of troubleshooting the old five-tube radios many years ago.

After I finished the RIT and audio circuits, I noticed the empty bags collecting on the bench, charting my progress. Obviously, as you finish a stage you should not have any parts left over in a bag. If you put in a wrong value early in the assembly, you will catch it when you are finishing up the bag of parts for the current stage you are building. When constructing the different stages, if you can't find a

part, remember to check the bag designated for your band. It is a separate bag of parts for 40 meters, so it will be marked 40M. Overall, quite failsafe construction.

I was ready when it came time to build the more complicated receiver. I was now familiar with the board and how to use the instruction manual. Your training in constructing the previous stages will

now pay off, as the receiver is going to have more parts and take up a good portion of the board.

When building the receiver and the transmitter, you'll find there is a large parts count. I recommend that you again identify each part and mount the parts on a piece of cardboard in the order of assembly. This will organize your building and again will help you with the parts identification.

As I constructed the receiver, I noticed that another voltage regulator was being added to the board. This was the third regulator — impressive, because voltage regulation equals stable performance.

I had no problems with the construction of the receiver, and following the instructions, I adjusted T-3 for maximum noise by ear (it doesn't take a rocket scientist to tune for maximum noise). Then I added a two-foot wire antenna jumper to TP6 (test point 6), and what surprised me was that I immediately heard signals. This was without any real antenna connected — I was only using the short jumper! Very impressive.

During your testing, don't forget to hook up all the controls; remember that the variable bandwidth control must be connected for the tests. It must be fully CCW and not clockwise for maximum signals, and please don't ask me what I did. I wanted to continue with the kit, but had to stop and play with the receiver. With an external antenna of 40 feet of wire hooked up to TP6, I commenced to cruise 40 meters. Checking out the RIT, the bandwidth control, I even went up to the lower phone portion and listened to lower single sideband phone, very clear and easy to tune in. The overall tuning was very smooth and positive. It was easy to tune in signals and they stayed put. The NW-40 is a very stable receiver.

Building the transmitter was very uneventful and the tuneup was easily accomplished. The transmitter uses a large type TO-220 transistor that is heat-sinked to the chassis. A very rugged system, and if the final should need replacing, it would be an easy process.

I have tested this unit at two Field Days, and have earned the local radio club's credit for "natural power."

QRP operations were conducted in a typical Field Day environment, with three transmitters in the area. I had no problem with the transceiver using a 40 meter doublet located 300 to 500 feet away from the other transmitter antennas. The EMTECH suffered no major front end overload problems and was easy to use. Its break-in circuits, RIT, and audio filters make it a topnotch unit. It only draws 50 mA on receive, and was perfect for solar power and "hand crank power."

Overall, this is a very stable, easy-to-build transceiver, almost immune to vibration and temperature changes. The large, rugged, tuning capacitor in the VFO is the kit's secret ,and you won't find this feature in other QRP kits. The receiver is very sensitive, detecting signals on 40 meters of 0.1µV,



Photo C. Breck K4CHE and Russ AA3HX operate the NW-40 at Field Day.

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Continued on page 51

VHF and Above Operation

C. L. Houghton WB6IGP San Diego Microwave Group 6345 Badger Lake Ave. San Diego CA 92119 [clhough@pacbell.net]

Accessories for Our HTs

Most all of us have become attached to the ubiquitous handie-talkie, or HT as we call it. It has become a very useful tool not only for communication purposes but also as a social tool enabling us to exchange ideas or just chew the rag with old friends — not to mention meet new ones on the air.

These HTs we depend on take quite a L beating in our briefcases, backpacks, and gloveboxes. They also get bumped into while attached to our belt. I know that I have been guilty of dropping my backpack down to the floor, only to hear a good clunk emanate from the HT as it hit. Or when wearing the HT on my belt, I've bumped it on the side of a closing elevator door. It is amazing that these very useful tools take quite a beating and still survive the physical rigors we subject them to. It's a great credit to the manufacturers' design teams for putting such a rugged piece of electronics into such a small package to protect it so well from

I remember looking at a two-channel crystal-controlled 2 meter HT at Western Radio here in San Diego quite a few years ago, and trying to decide if I wanted it or an Icom IC-202 SSB-only portable 2 meter (much larger than HT size) radio. This was at a time when military surplus ARC-5s were being converted to HF operations, and military surplus in electronics was king for those on a limited budget.

For those not familiar with the IC-202, it's about Webster's Dictionary size, with the front panel on the front or book binding side. It contains room inside for 9 "C"-size batteries. About twice the size of that first two-channel HT I saw. Needless to say, it took quite a few years to get from the simple 2 meter FM rigs in taxi cabs to our sophisticated HTs of today. I remember being put on a waiting list to obtain the really first synthesized 2 meter HT that I can remember, the Icom IC-02. What a powerful piece of electronic engineering when it was introduced.

The IC-02 incorporated so many features that we take for granted today - like programmable repeater shift, access tone frequencies, touchtone for dialing, and total frequency agility about the 2 meter band. There was so much competition to get one of these HTs that I got put on two waiting lists. Finally I was able to obtain one for myself. Two days later, the second dealer called stating that my turn to purchase another unit was here. and I accepted. I remember well that my partner Dave Gebler at Pac Bell in program services, also an amateur, had expressed interest in the HT but did not get on a list. I (deceptively) borrowed some money from him and purchased the HT, and presented to him the option of taking the HT or being

reimbursed at payday. He snapped up the HT so fast I never saw the box move. We enjoyed many years of operation with these two HTs, and kept in contact over the years with them.

Today, with even more sophisticated radios taking on the operation of a computer and contained in an HT body, the level of complexity astounds us to the point of having to carry a "cheat sheet" to remember how to access all the options the radios are capable of performing. Yes, I still have my old original IC-02 2 meter radio and have added its brothers the IC-03

IC-04 for 450, along with a dual-band IC-32A.

Getting into even more modern toys, I could not refuse the temptation of a Yaesu VX-1 and its VOX operation headset mike for gatherings and swap meet communications. It's great for low power communications, and has very wide band reception, covering AM broadcast through just about every communications mode up to 1 GHz. And it still transmits on 2 and 3/4 meters to boot. This radio is so small that if it did not have an antenna, you would lose it in your shirt pocket. It operates on

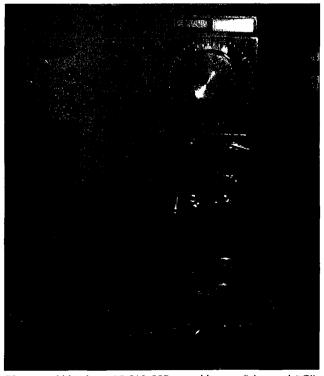


Photo A. Older Icom IC-202 SSB portable uses 9 internal "C"for 220 and the | size cells for portable operation.

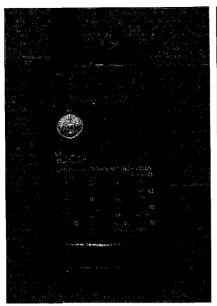


Photo B. New Icom IC-T81A four-band HT covers 6, 2, 3/4, and 23cm amateur bands. Five watt output on all bands, except for I watt on 1296 MHz (23cm).

a multi-cell Ni-MH that is smaller than a single AA cell.

Now just being offered from Icom is the world's first 4-band HT. Yes, I said "FOUR-BAND HT!" The IC-T81A is fully capable of covering 6 meters—50 MHz, 2 meters—150 MHz, 3/4 meter—450 MHz, and 23 centimeters—1240 to 1300 MHz! Wow! What a capable device! The IC-T81A is full-featured FM operation on all bands, with 5 watts on all bands below 450 MHz and 1 watt on 1296 MHz. Fully programmable splits, tones, and much, much more. Included with the standard HT is a Ni-MH 9.6 volt 680 mAH battery. I must be HT-crazy, as I still have

my old IC-02 (2 of them) and even a maritime model called the M-5. In my case, all of these HTs still function well today, saying a lot about the quality of construction both internally and externally.

Well what then are the bad points experienced today from all this venture into my worlds of HTs? Surprisingly enough, the older HTs fare better over longer periods of operation. Over the years, I have had them still keep on ticking. I have had to replace two internal lithium cells in the IC-02s, and the original NiCd cells in the same HTs. Remember, these radios are quite old and don't owe me anything, as they have functioned well and still do with these minor battery repairs. Comparing them to the more modern and much smaller multiband versatile HTs like the VX-1 and the IC-T81A. their operation is very good from a battery consumption use rate, but not as good as the earlier synthesized HTs.

The problem, as I brain it out, is that the computer-driven processes and higher power output on transmit (like my IC-T81A @ 5 watts which draws 1-1/2 amps on transmit) can take their toll when compared to a 2-watt-or-less HT. (Remember, the older HTs had large, high-capacity battery packs and double the size of these newer HTs.) If you plan to go to a daylong gathering where you intend to use your HT all day long, all of these HTs will perform well — especially if you switch to the low power options that most all have.

Where extended operation time is involved, something more is needed to pull off long-time continuous operation. This is where an external battery and its connections to various configurations or models of HTs being put to use can take form. The whole idea came up when I obtained a

Minolta digital camera to better describe and submit descriptions of conversions and items of note. This was in preference to not having to resort to the one hour (expensive) developing only to discover that I did not get what I wanted. Well, as with everything, there are pluses and minuses, and this digital camera had its own double-edged sword. The digital camera performed well, but

its operation with four (industrial-strength) alkaline cells lasted less than a half hour. It was a current magnet.

Well, something had to be done to enable a longer operation time without spending a lot of money on battery purchases. What was contemplated was an external battery of high amp-hour rating as could be found connected to the external battery jack on the camera. Of course, not using the original manufacturer's cord can take on ominous implications, especially if you reverse polarity during the construction and blow up the device you are attaching to. In other words, be very cautious and measure three and four times to be sure you have not made a simple error in your adaptation of an external battery and home-made cord. There is no room for error here, be very careful.

The cord I constructed for the IC-T81A was quite simple. I located the radio's external power jack at Radio Shack. It's a 3.5 mm o.d./1.3 mm i.d. part #274-1571A, so a small length of color-coded speaker wire or a length of wire from an old nolonger-used wall transformer can be used here. Be sure to include an in-line fuse of several amps for basic protection. Next, to ensure connection polarity when using several methods of connection, I broke the wire end and placed a two-conductor polarized molex/molded nylon connector pair (Radio Shack #274-222) to keep polarity from different ends proper. This was on the other end of the radio connection for cigarette lighter or belt pouch battery operation for portable use. This enables both mobile and portable operation with a simple cord patch. So far, there is about \$5 in parts in this, excluding the NiCds. See Fig. 1 for details on my cord for the IC-T81A.

If you have a similar radio and have jitters about constructing your own cord, Icom markets cords with a cigarette lighter plug (CP-12L) for car operation, and a less costly cord with wire ends for custom connections. The simple cord from Icom costs about \$12 (OPC-254L) and is suggested if you don't want to put your own cord together.

The search for suitable NiCds ended when I found several sets of 4-amp-hour computer batteries originally for a Toshiba 286 laptop computer. These were in original factory packages, and being for only a 286 computer, I knew they were orphans when I saw them. The dealer, having them on inventory for years, was glad to get rid of all of them for a few bucks each! What a find — if they would still take a charge. I figured they would be great, as they were never used or charged in over 5 years of sitting on a shelf.

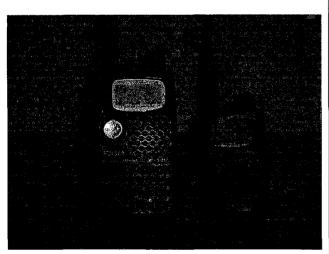


Photo C. Size comparison of Yaesu VX-1 dual-bander and Icom IC-T81A four-band HT.

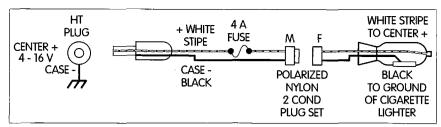


Fig. 1. Schematic of power cord that can be used either from cigarette lighter in auto or another nylon polarized connector for belt pouch long-life battery to extend HT operation time.

A test charge proved the batteries to be in great shape, if not original capacity. What a deal! The quest for large-diameter heat shrink, to make a professional pack, was abandoned due to its high cost, I wrapped my custom pack with paper center cores from paper towels, and electrical tape to insulate cells from each other. Construction here depends on the form you want to obtain from the finished cell layout, be it six in a row of two rows of three each, for example. If 12 volts is needed, a good configuration using "D"-size NiCds is three rows or three cells each. If you assume 1.35 volts for a fully charged cell, 9 cells work out to be 12.15 volts at full charge.

Other voltages are possible, depending on your needs. The Icom manual for the IC-T81A states that an external battery voltage of 4.5 volts to a maximum of 16 volts is possible. Be cautious with voltages above 16 volts, as when turning on the radio it will display "OVER V" and "UNPLUG THE RADIO IMMEDIATELY" to prevent damage to your radio. Most radios can stand a car's alternator charging voltage, which is over the nominal 12 volts, but mostly under 15 volts. I suggest that you verify your car's charging voltage to know what it is before connecting any device requiring 12 volts - just so you know what to expect. It's a prudent drill, and a simple test to make with a voltmeter.

Whatever your external battery pack form takes, it will provide you with many extra hours or even (as my pack does) several days of operations before charging is necessary. In the case of my digital camera, I purchased four Ni-MH to replace the internal "AA" cells and use them sparingly. The external "D" cell NiCd pack will give me quite a few hours and nearly a full day of operation compared to the 15 minutes on internal cells in the camera. Similarly, the lifetime of communications in portable or mountaintopping is greatly extended by the construction of this simple accessory, and no longer will you have to be confronted with the remark that your transmit is gobbling too much of your exhausted battery and you are dropping out of communications. It has happened to me so many times - but no longer, as I just connect the remote accessory cable and battery, or cigarette lighter adapter, and I am back in business.

Just be careful in constructing any cable for external power, as there are many simple twists allowing you to connect power up with reversed polarity. Just remember to make your cable difficult if not impossible to connect improperly in respect to polarity. This simple step will ensure your radio good health. Once you let the smoke out, as you know, it's very difficult to put it back in.

From the universal power cable I originally made for mountaintopping, I thought I was very clever in putting large alligator clips on the battery

end of the power cord. I had labeled the cords negative and black, and positive and red to ensure proper connection. However, it never occurred to me that in a heat of panic this was a simple connection that could have caused a fatal reversed polarity when trying to get equipment up to make a rare contact.

If you're faced with this situation, don't use the "suicide cord with clip leads." Make connections with similar two- or multiconnector nylon connectors. One to the battery and a mating connector to the equipment cord. Units of equipment that require different power or polarity use different nylon connectors peculiar to this device. Now, in any panic during connecting cables with coded connectors, it is still nearly impossible to make an error in connections, and your valuable radio and accessories will be protected from improper polarity and connections.

Well, that's it for this month. Projects in the mill include some light wave transmitter and receivers of simple construction. Kerry N6IZW and I are experimenting with them, and if we complete trials and construction, we might have things ready for next month. If you have any questions, please drop me a note on the Internet at [clhough@pacbell.net]. Best 73, Chuck WB6IGP.

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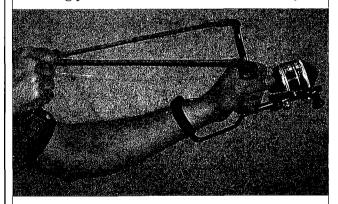
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More Software — RTTY on a Sound Card

I have come across a great program and have to tell you about it. The TrueTTY program URL, [www.dxsoft.com/], makes this software available, plus a logging program and another for CW. One of the nifty aspects of using a sound card program for RTTY is, at least in this case, that the connections between your computer and transceiver are the same as for PSK31. So, if you have been using one of the PSK31 programs, you already are hooked up to use TrueTTY.

There is also a PSK31 module in the program that allows you to work both modes from the same program. Even though I have been using Logger for some time, I find myself getting lazy when a lull in the RTTY activity comes along, and simply clicking on the PSK31 mode and chasing a slightly different warble tune.

A special attraction for me is the spectral tuning display. It works as well as any of the PSK31 waterfall displays, except it is wide, similar to DigiPan, and works the same in both modes. And that includes the Automatic Frequency Control, so you stay locked to either the RTTY received signal or the PSK31 signal. Plus, the button next to the AFC locks your transmitted signal to the same frequency as the one received.

The program is written by Sergei UA9OSV and he is doing a good job of supplying documentation in English for those of us who are Cyrillic-challenged. At the time of this writing, I have downloaded and installed updates to the program, and it appears the updates are coming at regular intervals.

Small inconveniences come with works in progress such as this beta version of shareware. But I found Sergei to be very cooperative when I messed up on the seemingly simple setup process. I thought I had all the ducks in a row, but when I told the program to transmit, a little window popped up and I could not continue beyond that point.

I found the program would work just like it was supposed to if I left my PT circuit disconnected and manually toggled the transmitter. Most of us get semi-accustomed to this with PSK31 before we rig a PTT circuit, so I was able to see the program in action before fixing the problem.

As a matter of fact, the accompanying screen shot was taken during this trial period. I was having too much fun to stop and worry about the minor abnormality of no PTT. Later, I E-mailed Sergei, gave him a description of the sequence of events as they appeared on the monitor, and it soon became clear where the problem lay.

There is a choice for using a full-duplex sound card and I had checked it. I was certain the SB16 was running full-duplex because that is the only circumstance that will allow the ChromaSound program to function. Sergei explained that should have been correct; however, in this case, it is necessary to not check that option. Once that is understood, the program functions like clockwork.

The program, as I mentioned, is shareware, but the only cripple built into the unregistered version is the fact you cannot save the setup. That doesn't sound like much of an impediment except you will find the default fonts are virtually unreadable. It is necessary to at least change the font in the receive window to prevent eye strain. There are two other areas in which you will find you will wish to alter the font as well and these get a little tiring. The \$35 registration fee puts an end to this repetitious effort. A small price to pay for convenience.

You will notice the screen shot says the program is unregistered, and it was at the time. That was when I was getting a real charge out of operating the program with manual PTT and watching it pick out signals and track them as well as "zero-beat" on those received signals so the transmitted signal was right on the money. What I am saying is that you can easily check out the program before you lay your cash on the line.

After a few RTTY contacts, I tuned over to the PSK31 signals and clicked to change modes, and the program was functioning in that mode. Simple as two mouse clicks and I was there. The same spectral display was in place, along with the macros which I would later learn to customize. The first obvious difference was the single tuning indicator as opposed to the RTTY pair in the spectral display.

As soon as I tuned to a signal, the familiar lower and upper case characters started appearing across the receive screen. I made a couple of contacts there and then felt it was time to fix the aforementioned PTT problem.

The biggest thing I missed with the program is something 1 need badly. I make many more than my share of typos, and PSK31 programs usually support sending a backspace to magically repair those errors I put on your screens. TrueTTY does not as yet support this feature. I had to get into the habit of sending a series of xxxx's instead.

As a matter of fact, I just observed another user of the program doing the same calisthenics for his typos. For a time, that will be an obvious identifier for those using the program in the PSK31 mode. Maybe, if we would persist in using this program, hams as a group would become better typists, thanks to Sergei.

That isn't as difficult as I make it sound, and Sergei tells me he will work on that part. I think of it as something that doesn't exist in RTTY and that is the original function of the software. PSK31 came later.

The other thing I miss, being a Logger fan, is a log. I make notes, then forget to bring up the logging program and make records. However, you will notice there is a fix for that problem on the DXSoft Web site.

They have their own logging program that works with the communications package. More goodies. At this time, I have not gone for the AALog. I am sure it is a good program and serves the user well, but I try to keep things simple. Is there an advantage to having more than one log? I don't really want to start down that road.

I must mention the fact that every ham I work remarks about the good quality of the signal they are receiving. This is true in either mode. I think that speaks well for the program. Though RTTY is a fairly straightup mode, we have to recall how many tweaks we would make in a TNC to get it just right. This is more like plug-n-play than most of the professional, high bucks Windows95TM programs we install. And I have not received any complaints of overdriving on PSK31 which is an easy infringement. Of course, this is after having the system operating with other PSK31 programs.

After using this program on the air for the past two weeks, I find a lot of interest in a sound card program for RTTY. At least half the hams I mention it to ask for the URL. A few have gotten back to me via E-mail to tell me their feelings on it. The bottom line is it is an easy install, the setup goes well (careful of the full-duplex check), all the operator functions are in place to take a test drive before you purchase, and it works with the same hookup as most PSK31 programs. Take a look.

New toy

Sometimes we profit from experience, even if it be reluctantly. In this case, I did a right thing first and purchased a kit in assembled form. The reason was that I was entering grounds never before traveled by this explorer. This made one part of the equation relatively secure and allowed for tweaking other areas to get things to work. The hesitation mentioned resulted only from my normally frugal approach.

You may have wondered the same thing I have about the ability of your computer to converse directly with your transceiver. I know there are readers who also use the Icom 735, and this will hit home there, but I am certain users of other brands and models can benefit from my recent experience.

I have been using Logger for some time now, and had observed the trials of hams getting the program to recognize the frequency of the radio. I wasn't sure just what was needed for an interface, because the owner's manual is fairly mute on this point. Then I found reference to JBI Products, saw they had an interface to do the job, plunked down the credit card, and about a week later had what appeared to be a plug-n-play toy.

Well, okay, it plugs in, but how do we watch it play?

I had a few programs around that were touted to allow a computer to control the 735. My first venture, however, was to load the Log-EQF program that came in the package because that should be sure-fire. I didn't really want a different logging program, though this appears to be quite a work of art.

At first glance, it appears to be "just a DOS program." It is, but then I started through the lengthy, well-written documentation and realized how well thought out the program is. After gaining enough knowledge to get the program into an operating mode, sure enough, the program

Source for:	Web address (URL):
TrueTTY — Sound card RTTY w/ PSK31	www.dxsoft.com/mitrtty.htm
Pasokon SSTV programs & hardware	www.ultranet.com/~sstv/lite.html
PSK31 — Free — orig. PSK31 — also Logger	http://aintel.bi.ehu.es/psk31.html
Site with links to PSK31 and Logger 6.12	www.mysite.com/k5fq
PSKGNR — Front end for PSK31	www.al-williams.com/wd5gnr/pskgnr.htm
TAPR — Lots of info	www.tapr.org
TNC to radio wiring help	http://freeweb.pdq.net/medcalf/ztx/
ChromaPIX and ChromaSound DSP software	www.siliconpixels.com
Timewave DSP & AEA products	www.timewave.com
Auto tuner and other kits	www.ldgelectronics.com
XPWare — TNC software with sample DL	www.goodnet.com/~gjohnson/
RCKRtty Windows program with free DL	http://home.t-online.de/home/dl4rck/
HF serial modern plans & RTTY & Pactor	http://home.att.net/~k7szl/
SV2AGW free Win95 programs	www.forthnet.gr/sv2agw/
Source for BayPac BP-2M & APRS	www.tigertronics.com/
BayCom German site	www.baycom.de/
BayCom 1.5 and Manual.zip in English	www.cs.wvu.edu/~acm/gopher/Software/baycom/
N1RCT site — excellent RTTY ref.	http://www.megalink.net/~n1rct/
Int'l Visual Communication Assn. — nonprofit org. dedicated to SSTV	www.mindspring.com/~sstv/
Creative Services Software	www.cssincorp.com
Helischreiber & MT63	www.freeweb.org/varie/ninopo/lz8bly/index.htm

Table 1. The chart from Hell(er) — your guide to good things on the Web.

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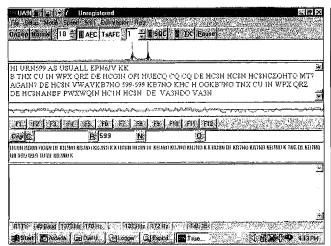


Fig. 1. TrueTTY screenshot. This was the second QSO using the program, hence the "unregistered" notation at the top. This should prove it isn't crippled as you download it. The five active portions of the screen start at the top with the wide spectral display. I find that it "copies" even when not tuned precisely, but the AFC will get it right on for you immediately. If you wish to tune quickly to an adjacent signal, you can do so by simply clicking on the displayed signal. Of course, this means your displayed frequency doesn't read correctly, but you will remain inside the band. The received text is displayed in the next area down. Just below that is the "oscilloscope" display of the received signal. The bottom two screens are the "sent" signals with the compose area at the bottom. I had captured this shot after the OSO was completed, so the compose area was empty. However, the program supports "type ahead," so I will usually have several lines ready and waiting when the other operator turns it back to me.

73 Ad Sales

was displaying the radio frequency. Great, it's gonna work!

On to the next test

This is getting easy. I had a program written by NIAED to control the 735 by way of the CT-17 interface which the JBI box is to replace. I loaded this and gave it a try and it worked. A little sluggishly and sometimes a bit on the peculiar side, but it was doing the things that the radio would allow. That is, it read frequency, changed frequency and modes, and applied memory already programmed into the rig.

Now was the time to go back and see how this worked for the desired purpose. With everything in

place and Logger working, it did not work. Boy, was I glad I tried the other stuff first.

The 735 has one problem for this application that I had several notes on. The information from the radio was coming at 1200 baud. Some programs obviously agree to that speed. Logger likes a little more

speed. As one ham put it, "The radio talks, but the program doesn't listen. One of them is female and the other is male."

There is a jumper to change in the radio, barely mentioned in the Icom manual, that allows the baud rate to be bumped up to 9600. At that point, Logger listens and life is better. Not best, just better. There is more.

For the Icom 735 enthusiasts in the group, the jumper is J22. You can find it pictured in the manual. Looking at the jumper locations from the front of the radio and numbering them 1 to 5 from right to left, move the jumper from position 4 to position 5. That is all there is to that.

You will discover once you have arrived at this pinnacle of success that there are some things lacking. The first is, the PTT does not work through the interface. If you were using the serial port to key the rig when you click transmit, it no longer honors that command.

Also, the readings are often a bit strange. I first noticed the readouts did not track as I turned the dial, and then they were apt to catch up. But, whoa, then the reading might just go to 30,000 kHz or so, which upsets the program because there is a pop-up warning that you are operating out of band.

I have watched the Logger reflector and found other hams with similar experiences, and have not noticed a definitive cure. The "works-most-of-the-time" cures are tweaking the tuning knob just a little off, then back on frequency, changing to LSB, then back to USB, or clicking the snap button in the program. The most often effective cure for me occurs when there is a signal present and then it helps to change to LSB and

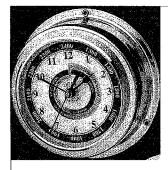
I would think this is a Logger problem. but I find the readouts were not up to par with other programs I had already tried, so it may be that this little radio just doesn't want the world to know what it is doing if we are too lazy to sit in front of it and operate the knobs and watch the dials (readouts).

The PTT problem was resolved, as I took the interface apart to be sure the DTR pin was accessible. It was, so I snaked a piece of audio cable through the interface so it exited through a hole I drilled in the case, and installed a serial jack on the new piece of dangling cable. I plugged the PTT cable into the jack and all systems were back to as normal as they get in this shack.

All these radios we deal with have their compromises, and this is only one of many. I talk to other hams, and almost everyone who gives a new mode a try finds a different problem. That must be where the sport enters into the equation, and that keeps making fodder for future columns.

If you have questions or comments about this column, E-mail me [jheller@sierra.net]. For now, 73, Jack KB7NO.

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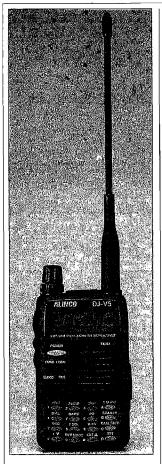
Dr. Rick Olsen N6NR Western Washington DX Club P.O. Box 538 Issaquah WA 98027-0538

The DX Dynasty Entities List

I am going to dispense with the column this month so that I can provide you with an updated DX Dynasty Award Entities list. We haven't published one in some time now, and I apologize for that. Look this over and tell me if I have left anything out. Vy 73 and gud DX!!

1AØ	SMO MALTA	5Y-5Z	KENYA	CEØ/A	SAN AMBROSIO
IS	SPRATLY ISLAND	6V, 6W	SENEGAL	CEØ/F	SAN FELIX
3A	MONACO	6Y	JAMAICA	CM, CO	CUBA
3B6	AGALEGA ISLAND	70	YEMEN	CN	MOROCCO
3B7	ST BRANDON ISLAND	70/S	SOCOTRA ISLAND	CP	BOLIVIA
3B8	MAURITIUS ISLAND	7P	LESOTHO	CQ, CT	PORTUGAL
3 B 9	RODRIGUEZ ISLAND	7Q	MALAWI	CT3	MADEIRA ISLAND
3C	EQUATORIAL GUINEA	7T-7Y	ALGERIA	CU	AZORES ISLANDS
3CØ	ANNABON ISLAND	8P	BARBADOS	CV-CX	URUGUAY
3D2	CONWAY REEF	8Q	MALDIVE ISLANDS	CY9	ST PAUL ISLAND
3D2	FIJI ISLANDS	8R	GUYANA	CYØ	SABLE ISLAND
3D2	ROTUMA ISLAND	9A, YU2	CROATIA	D2, D3	ANGOLA
3DA	SWAZILAND	9G	GHANA	D4	CAPE VERDE ISLANDS
3V	TUNISIA	9H	GOZO ISLAND	D6	COMOROS
3W, XV	VIETNAM	9H	MALTA	DA-DL,	
3X, X V	GUINEA	91, 9J	ZAMBIA	Y2-Y9	FED REP OF GERMANY
3Y/B	BOVET ISLAND	9K	KUWAIT	DM. Y2-Y9	EAST GERMANY
3Y/P	PETER IST ISLAND	9L	SIERRA LEONE	DIVI, 12 17	(before Oct. 2, 1990)
4J. 4K	AZERBAIJAN	9M2, 9M4	WEST MALAYSIA	DU-DZ	PHILIPPINES
4J1	MALYJ-VYSTOSKIJ	9M6, 9M8	EAST MALAYSIA	E3	ERITREA
431	(M-V) ISLAND	9N	NEPAL	E4	PALESTINE
4K2, UA1	FRANZ JOSEPH LAND	9Q-9T	ZAIRE	EA6-EH6	BALEARIC ISLANDS
4K2, UK1 4L. UF	GEORGIA	9U	BURUNDI	EA8-EH8	CANARY ISLANDS
4L, OF 4P-4S	SRI LANKA	9V	SINGAPORE	EA9-EH9	CEUTA AND MELILLA
4r-43 4U	UNITED NATIONS-	9X	RWANDA	EA-EH	SPAIN
40	GENEVA	9Y	TRINIDAD & TOBAGO	EI, EJ	IRELAND
4U	UNITED NATIONS-	A2	BOTSWANA	EK EK	ARMENIA
40		A3	TONGA ISLAND	EL	LIBERIA
AT LITTI	VIENNA	A4	OMAN	EM-EO,	LIBERIA
4U1ITU	ITU HQ GENEVA	A5	BHUTAN	UR-UZ	UKRAINE
4U1UN	UNITED NATIONS-	A6	UNITED ARAB	EP, EQ	IRAN
47.11.33.17	NEW YORK		EMIRATES	EP, EQ ER	MOLDOVA
4U1WB	WORLD BANK	A7	QATAR	ES	ESTONIA
4W	UNITED NATIONS-	A9	BAHRAIN		ETHIOPIA
	TIMOR TIMUR	AP-AS	PAKISTAN	EU-EW	BELARUS
	(after March 1, 2000)	BS7	SCARBOROUGH REEF		
4X, 4Z	ISRAEL	BV	TAIWAN	EX	KYRGYZSTAN
5A	LIBYA	BV9	PRATAS ISLAND	EY	TAJIKISTAN
5B	CYPRUS	BY, BT	CHINA	EZ	TURKMENISTAN
5H, 51	TANZANIA	C2 .	NAURU .	F	FRANCE
5H1	ZANZIBAR	C3	ANDORRA	FG	GUADELOUPE
5N, 5O	NIGERIA	C5	GAMBIA	FH	MAYOTTE
5R	MADAGASCAR	C6	BAHAMA ISLANDS	FJ-FS	ST MARTIN ISLAND
5T	MAURITANIA	C9	MOZAMBIQUE	FK	NEW CALEDONIA
5U	NIGER	CA-CE	CHILE	FK/C	TX CHESTERFIELD
5V	TOGO	CEØ	EASTER ISLAND		ISLAND
5W	WESTERN SAMOA	CEØ	JUAN FERNANDEZ		Continued on page 50
C 7 1	TICLANTO A	I .	(CI AND)	1	Continued on reco 5/

ISLAND



Alinco's "Clear" DJ-V5

Alinco USA has released new "clear" or "see-through" versions of its popular DJ-V5 VHF+UHF hand-held transceiver. The DJ-V5TDC (dry cell pack) and DJ-V5TDCH (NiCds) have only a faint coloration that appears as part of the manufacturing process. Most people see it as a slight blue tinge in the outer case that otherwise reveals the placement of PCB, display, lighting, speaker, and so forth.

These compact transceivers are designed to operate in the 2m and 70cm bands. They feature alphanumeric display, up to 5 watts power output, 200 memories, expanded receive capability offering coverage from 76–999.995 MHz (cellular-blocked), narrow and wide FM receive modes, and CTCSS encode and decode.

Some additional features include four scan modes, five programmable scan banks, automatic internal temperature protection, cable cloning, SMA antenna connector, 13.8 VDC direct input, four different European tone bursts, autodial memories, input voltage display with overvoltage warning, MARS/CAP capability, and adjustable AF audio tone. Alinco will continue to offer the black version of the radio, too.

For further info, contact Alinco USA, 438 Amapola Ave., Ste. 130, Torrance CA 90501; tel. (310) 618-8616; fax (310) 618-8758.



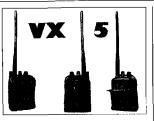
Ham Price Guide 2nd

This new hands-on book contains prices for 3,800 different ham items — prices

not from the Internet or someone's opinion, but actually taken from recent auctions or as advertised "For Sale."

Included are the date of the sale, claimed condition, and details about pertinent options, accessories, and manuals. 84pp., softbound, 8-1/2" x 11", \$11.95 plus \$2 shipping USA, \$4 elsewhere.

To order or for further info, contact Eugene Rippen WB6SZS, PO Box 9, Auburn CA 95604; tel. (530) 888-6020.



PowerPort VX-5 Radio Glove

This pouch, produced by Cutting Edge Enterprises, is a real winner. Besides coddling your VX-5 (or VX-500) in protective leather, it also solves a couple of complaints that VX-5 users sometimes have. One is that there just isn't a comfortable or secure place for the extra antenna tip with the radio. Another is that the belt clip won't stay on your belt.

The Radio Glove has a sturdy spring steel belt clip that bites your belt like an alligator, with a leather covering that won't leave tooth marks. And there is a perfectly sized pocket at the back of the pouch that securely holds either extra tip and keeps it right there with your radio.

And it's beautifully crafted, too — nothing beats the feel or the smell of fine glove leather. The pouch's Velcrostyle closure provides easy access to the display. The PTT button is still fully accessible while the radio is in the pouch, and the speaker holes are well placed for optimal listening. In fact, the leather seems to attenuate some of the high-pitched speaker hiss that may occur.

For further information or to order part #HI-51 (\$19.95), contact Cutting Edge Enterprises, 1803 Mission Street, Ste. 546, Santa Cruz CA 95060; tel. (800) 206-0115; E-mail [cee@cruzio.com].



New Soldering Station from Elenco

The SL-5 Soldering Station from Elenco is electronically controlled to provide 5 to 40 or 60 watts, and is ideal for professionals, students, hobbyists, and hams. The unit includes a holder funnel for the iron, sponge pad for cleaning

the tip, and on/off indicator light. A special safety feature is a ground fault detection circuit that warns you if you're not properly connected to earth ground.

This iron features a cushionhandle grip, and an easily replaceable grounded tip for static-sensitive devices. The base is made from heavy, nonslip steel, and the funnel can be mounted on either side.

For more information, contact Elenco Electronics, Inc., 150 W. Carpenter Ave., Wheeling IL 60090; tel. (800) 533-2441; fax (847) 520-0085; E-mail: [elenco@elenco.com]; site: [www.elenco.com].

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Tur NU	Eonus 4	KC6	BELAU	SØ	WESTERN SAHARA		
THE DX FORUM continued from page 47		KG4	GUANTANAMO BAY	ST	SUDAN		
continuea jr	om page 47	KHI	BAKER ISLAND	STØ	SOUTHERN SUDAN		
FM	MARTINIQUE	KHI	HOWLAND ISLAND	SU	EGYPT		
FO	FRENCH POLYNESIA	KH2	GUAM	SV5	DODECANESE ISLANDS		
FO/A	AUSTRAL ISLANDS	KH3	JOHNSTON ISLAND	SV9	CRETE		
FO/C	CLIPPERTON ISLAND	KH4	MIDWAY ISLAND	SV-SZ	GREECE		
FO/M	MARQUESAS ISLANDS	KH5	JARVIS ISLAND	SY, SV/A	MOUNT ATHOS		
FP	ST PIERRE ISLAND	KH5	PALMYRA ISLAND	T2	TUVALU		
	AND MIQUELON	KH5K	KINGMAN REEF	T3	CENTRAL KIRIBATI		
FR	REUNION ISLAND	KH6	HAWAII	T31 T32	PHOENIX EAST KIRIBATI		
FR/E	EUROPA ISLAND	KH7 KH8, AH8	KURE ISLAND	T33	BANABA ISLAND		
FR/G	GLORIOSO ISLAND	KH9	AMERICAN SAMOA WAKE ISLAND	T3Ø	WEST KIRIBATI		
FR/J	JUAN DE NOVA ISLAND	KHØ	MARIANA ISLAND	T5	SOMALIA		
FR/T FT/W	TROMELIN ISLAND CROZET ISLAND	KL7, AL7.	MANIANA ISEAND	T7	SAN MARINO		
FT/X	KERGUELEN ISLAND	WL7	ALASKA	T9, 4N4,			
FT/Z	AMSTERDAM AND	KPI	NAVASSA ISLAND	YU4	BOSNIA-HERZEGOVINA		
1 1/2	ST PAUL ISLAND	KP2	VIRGIN ISLANDS	TA-TC	TURKEY		
FW	FUTUNA ISLAND	KP3, KP4	PUERTO RICO	TF	ICELAND		
FW	WALLIS ISLAND	KP5	DESECHEO ISLAND	TG, TD	GUATEMALA		
FY	FRENCH GUIANA	LA	NORWAY	TI, TE	COSTA RICA		
G, GX	ENGLAND	LO-LW	ARGENTINA	TI9	COCOS ISLAND CAMEROON		
GC, GW	WALES	LX	LUXEMBOURG	TK	CORSICA		
GD, GT	ISLE OF MAN	LY, UP	LITHUANIA	TL	CENTRAL AFRICAN		
GI	NORTHERN IRELAND	LZ	BULGARIA	1.5	REPUBLIC		
GJ, GH	JERSEY	NN3SI	SMITHSONIAN	TN	CONGO		
GM GU	SCOTLAND	OA-OC	INSTITUTION PERU	TR	GABON		
GU H4	GUERNSEY SOLOMON ISLANDS	OD OD	LEBANON	TT	CHAD		
H4Ø	TEMOTU ISLAND	OE	AUSTRIA	TU	IVORY COAST		
HA, HG	HUNGARY	OF-OI	FINLAND	TY	BENIN		
HB	SWITZERLAND	онø	ALAND ISLANDS	TZ	MALI		
HBØ	LIECHTENSTEIN	OJØ	MARKET REEF	UA1.3-6	EUROPEAN RUSSIA		
HC, HD	ECUADOR	OK, OL	CZECH REPUBLIC	UA2	KALININGRADSK		
HC8, HD8	GALAPAGOS ISLAND	OK, OM	CZECHOSLOVAKIA	UA9-Ø UJ	ASIATIC RUSSIA TADZHIKISTAN		
НН	HAITI		(before Dec. 31, 1992)	UK	UZBEKISTAN		
HI	DOMINICAN REPUBLIC	OM	SLOVAK REPUBLIC	UN, UQ	KAZAKHSTAN		
нј, нк	COLOMBIA	ON-OT	BELGIUM	V2	ANTIGUA		
HKØ	SAN ANDRES ISLAND	OX	GREENLAND	V2	BARBUDA		
HKØ/B HKØ/M	BAJO NUEVO	OY	FAROE ISLANDS	V3	BELIZE		
HKØ/P	MALPELO PROVIDENCIA ISLAND	OZ P2	DENMARK PAPUA NEW GUINEA	V4	NEVIS ISLAND		
HL HL	SOUTH KOREA	P4	ARUBA	V4	ST KITTS		
HO, HP	PANAMA	P5	NORTH KOREA	V5	NAMIBIA		
HR	HONDURAS	PA-PI	NETHERLANDS	V6 V7	MICRONESIA		
HS	THAILAND	PJ	CURACAO	V8	MARSHALL ISLAND BRUNEI		
HV	VATICAN CITY	PJ	NETHERLANDS	VE, VO	CANADA		
HZ	SAUDIA ARABIA		ANTILLES	VK. VO	AUSTRALIA		
I	ITALY	PJ2,4,9	BONAIRE, CURACAO	VK7	TASMANIA		
IS	SARDINIA	PJ5-8	SINT MAARTEN,	VK9C	COCOS KEELING		
J2	DJIBOUTI		EUSTATIUS		ISLAND		
J3	GRENADA	DDG DVG	ISLANDS	VK9L	LORD HOWE ISLAND		
J5 J6	GUINEA-BISSAU	PPØ, PYØ	FERNANDO DE	VK9M	MELLISH REEF		
J0 J7	ST LUCIA DOMINICA	PPØ, PYØ	NORONHA TRINIDADE AND	VK9N	NORFOLK ISLAND		
J8	ST VINCENT	FFØ. F 10	MARTIM VAZ	VK9X	CHRISTMAS ISLAND		
JA-JS	JAPAN	PPØ. PYØ	ST PETER AND PAUL	VK9Z VKØ/H	WILLIS ISLAND HEARD ISLAND		
JD1/M	MINAMI TORI SHIMA	110,110	ROCKS	VKØ/M	MACQUARIE ISLAND		
JD1/O	OGASAWARA ISLAND	PP-PY	BRAZIL	VP2E	ANGUILLA		
JT-JV	MONGOLIA	PZ	SURINAM	VP2M	MONTSERRAT		
JW	SVALBARD ISLAND	S2	BANGLADESH	VP2V	BRITISH VIRGIN		
JX	JAN MAYEN ISLAND	S5, YU3	SLOVENIA		ISLANDS		
JY	JORDAN	S7	SEYCHELLES	VP5	TURKS AND CAICOS		
JY1	HM KING HUSSEIN (SK)	S9	PRINCIPE		ISLANDS		
K7UGA	SEN BARRY M	S9	SAO TOME	VP8	FALKLAND ISLANDS		
KC4, CE9	GOLDWATER (SK) ANTARCTICA	SA-SM	SWEDEN	VP8/G, LU	SOUTH GEORGIA		
•		SN-SR	POLAND	t	ISLAND		
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VP8/H, LU, CE9, HFØ, 4K1 SOUTH SHETLAND **ISLAND** SOUTH ORKNEY ISLAND VP8/O, LU VP8/S, LU SOUTH SANDWICH ISLAND VP9 **BERMUDA** VQ9 CHAGOS VR2, VS6 HONG KONG VR6, VP6 PITCAIRN ISLAND VU INDIA VU LACCADIVE ISLANDS VU7/A ANDAMAN ISLAND VU7/L LAKSHADWEEP ISLAND VU7/N NICOBAR ISLAND W. K. N. UNITED STATES OF AA-AK **AMERICA** WIAW ARRL HO W2NSD WAYNE GREEN (Still Kicking) W6RO HMS QUEEN MARY XA4-XI4 **REVILLA GIGEDO ISLAND** XA-XI **MEXICO** XT **BURKINA FASO** XU CAMBODIA XWLAOS XX9 **MACAO** XY, XZ **MYANMAR** YA **AFGHANISTAN** YB, YC INDONESIA ΥI IRAO YJ VANUATU YK **SYRIA** YL. UO LATVIA **NICARAGUA** YN YO-YR **ROMANIA EL SALVADOR** YS YT, YU, YZ YUGOSLAVIA YVØ **AVES ISLAND** YV-YY VENEZUELA Z_2 **ZIMBABWE** Z3, 4N5, MACEDONIA YU5 Z.A ALBANIA ZB **GIBRALTAR** ZC4 **UK SOV BASES** ON CYPRUS ZD7 ST HELENA ISLAND ZD8 ASCENSION ISLAND ZD9 GOUGH ISLAND ZD9 TRISTAN DE CUNHA ZF **CAYMAN ISLANDS** ZKI COOK ISLAND ZK2 **NIUE ISLAND** ZK3 **TOKELAU** ZL, ZM **NEW ZEALAND** ZL7 **CHATHAM ISLAND** ZL8 KERMADEC ISLAND ZL9/A AUCKLAND ISLAND ZL9/C CAMPBELL ISLAND **PARAGUAY** SOUTH AFRICA ZR-ZU ZS8/E PRINCE EDWARD **ISLAND** ZS8/M MARION ISLAND

ZS9

WALVIS BAY

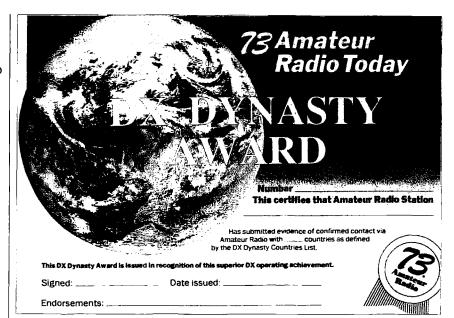


Photo A. The DX Dynasty Award Certificate.

QRP with the OHR 500 continued from page 26

the Colorado QRP Club had its weekly 2 meter net. So I asked a few check-ins to stay after and help me check my signal. Sure enough, I wasn't zero-beat. A quick realignment of the BFO fixed that, and it's been smooth sailing ever since.

I can easily key the rig with a straight key, a paddle and keyer, or a computer using contesting software and a basic serial/parallel port keying interface. I am getting quick responses even under the most trying of band conditions. Recently, during the first Second Class Operators Club Marathon Sprint (this really is another story). I decided to test out the OHR 500 at QRPp levels, so I set it at 250 mW, and worked PA. CA. OK, TX. MN. WA, AZ, and FL.

The Florida QSO was with Bob Patten N4BP, founder and CEO of the Second Class Operators Club. I did a calculation on distance from my QTH in Colorado, and it worked out to be roughly 6,500 miles per watt. So I'll use Bob's QSL card and the OHR 500 to apply for my Miles-Per-Watt certificate.

The long and the short of it: You can't go wrong with the OHR 500. I would say that the rig is not for the beginning builder. But with one or two singleband rigs under your belt, I would have no hesitation in recommending that you tackle this five-band marvel.

As for the future, I plan to add a memory keyer to the rig, and I am building the Oak Hills Research DD-1 Frequency Counter/Digital Dial Kit to plug directly into the Oscillator Out jack in the back of the rig. Plus, you'll find the OHR 500 on the air during Field Day 2000 at the Colorado QRP Club's Aloha Field Day site west of Denver.

The OHR 500 is available from Oak Hills Research, A Div. of Milestone Technologies Inc., 2460 S. Moline Way, Aurora, CO 80014. Ph. (303) 752-3382. Orders. (800) 238-8205, Fax (303) 745-6792. E-mail, [qrp@ohr.com].

Now, if you'll excuse me, I need to get on the air.

Another Look at the NW-40 continued from page 40

and the transmit power can be adjusted up to 6 watts. If you haven't built any kits lately, try this one. You'll be the center of attraction at Field Day and bring in those extra bonus points — plus, you can join the QRP crowd on 40 meters.

The current price of a complete kit with audio filter and cabinet is \$130. Partial kits are available. Contact EMTECH at 1127 Poindexter Ave. W., Bremerton WA 98312. Their Web page is at [www.emtech.steadynet.com].

Amateur Radio Via Satellites

Andy MacAllister W5ACM 14714 Knights Way Drive Houston TX 77083-5640

Your Home Sat Station

Last month, we investigated advanced portable techniques for contacts via the FM, crossband repeater in the sky, AMRAD-OSCAR-27. OSCAR is an acronym for Orbiting Satellite Carrying Amateur Radio. Now it's time to look at the basics of a functional home station.

In 1980, the most common hamsat communications mode was mode "A", two meters up and 10 meters down. A typical home hamsat station consisted of a shortwave (HF) transceiver for downlink reception and some method of generating CW or SSB on the two meter uplink, usually with a transmit converter and amplifier. Multimode VHF radios were available, but expensive.

Antennas for reception ranged from indoor dipoles to multi-element Yagis. Uplink antennas were small VHF beams with two rotators, one for azimuth and one for elevation. Tracking was done with graphical aids like the OSCAR Locator. Home computers were not yet common.

Times have changed, but not that much. You can still get on mode "A" via two Russian hamsats; RS-12/13 and RS-15. It's fun and it works, but the most common mode today is "J", two meters up and 70 cm down. Most amateur-radio communications satellites have a mode "J" system on board. The "J" came from the transponder name assigned to the transponder on AMSAT-OS-CAR-8 from JAMSAT in Japan.

The rig

There are many ham radios that can be used for satellite communications. Money is almost always the key factor. From new

to home-brew, the desired end result is to make contacts via the hamsats.

On the new and expensive end of the spectrum, an excellent do-it-all rig is the Yaesu FT-847. At around \$1750, this multiband, multimode transceiver can do almost anything from 160 meters through 70 cm. It has four antenna connectors; HF, six meters, two meters, and 70 cm. It can be set for full-duplex crossband operation between the separate external connections. This includes all of the HF/VHF/UHF satellite modes with the exception of "Mode K", 15 meters up and 10 meters down, on RS-12/13. Kenwood and Icom have their own versions of satellite radios. Watch for new ones to compete with Yaesu.

A less expensive way to prepare a home station is to use your current gear and augment it with older multimode VHF and UHF rigs from swapfests and on-line auctions. If you have been following the previous Hamsats columns, you know that a dual-band handietalkie can be used for satellite contacts via AO-27 and SUNSAT-OSCAR-35.

In February, a new/old satellite was added to the fleet of FM hamsats. In January 1990, UoSAT-OSCAR-14 was launched. It began its on-orbit activities in the amateur bands as a digital store-and-forward packet satellite. It was the first 9600-baud hamsat, and it worked extremely well. After 18 months,

it was commanded to non-amateur frequencies for use by VITA (Volunteers in Technical Assistance). Now, eight and a half years later, the packet system has problems and is no longer useful by VITA. Chris Jackson G7UPN/

ZL2TPO at the University of Surrey in England has reconfigured UO-14's systems for use as a crossband FM repeater, once again in amateur operation. Unlike AO-27 that is active only for daylight passes, UO-14 is active all the time. The uplink is on 145.975 MHz and the downlink can be found on 425.070, plus or minus Doppler.

There is nothing wrong with a simple portable or mobile system for home-station use. With a constant power source and potentially better antennas, HTs and mobile rigs make a great start. For 10-meter reception, a simple monoband transceiver can add

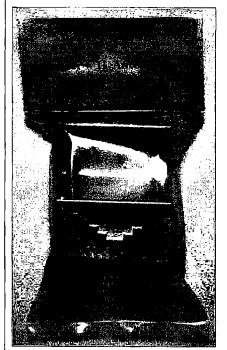


Photo B. Arrow Antenna of Cheyenne, Wyoming, offers a mounting bracket for home or stationary use of their Arrow II satellite antenna.



Photo A. A Yaesu FT-847 tuned and ready for a UoSAT-OSCAR-14 FM-voice pass.

mode "A" reception. Check out some of the inexpensive 10-meter rigs from Copper Electronics of Louisville, Kentucky, at [http://www.copper.com].

Feedline

In your car or on the street, coax length is short, and the loss characteristics of the feedline are not an issue. Unless your home station antennas are within 20 feet of your rig, the coax cable becomes a point of concern. Use the best cable you can afford for UHF and VHF runs. Avoid small-diameter cable like RG-58. As a minimum, install Belden RG-8 or 9913. Avoid inexpensive off brands and cheap connectors with plastic dielectric (insulator) materials. HF-frequency coax runs are not as critical if the distance from the rig to the antenna is less than 100 feet. I use RG-8 on 10 meters and two meters, and 9913 on 70 cm. At 1.2 GHz I use 7/8-inch hardline, but that's another story. At 2.4 GHz, the down converter (13 cm to two meters) is mounted at the antenna.

Antennas

Once again, it is a proven fact that simple antennas can be used for satellite chasing. If you have an Arrow II antenna [http:// members.aol.com/arrow146/index.html], or something similar, for AO-27 portable work, there's no reason it can't be used at home. In addition to the hole in the handle that has been predrilled for use with a camera tripod, Arrow offers a special mounting bracket to clamp the antenna to a pole.

There are many very inexpensive TV rotators that can be used on small satellite arrays like the Arrow II. While all TV rotators are designed for azimuth rotation, they can be adapted for elevation control with very little effort. Turn a typical rotator on its side and mount it to the top of the azimuth rotator. If this is prohibitively hard, mount it horizontally to a short pole coming out of the top of the azimuth rotator. The boom for the satellite antenna(s) is then passed through the new elevation rotator. Keep pole lengths short to avoid an unbalanced system. Also, if possible, put a cover over the modified elevation rotator. It was not designed for horizontal installation, and thus it will collect rain water and condensation in the wrong places. I have used a plastic wastepaper basket, with holes cut for the horizontal antenna boom.

If money is not a problem, you can spend a lot of it on satellite antennas and a rotator system. Cushcraft has some relatively inexpensive hamsat antennas, while KLM and M-Squared have some of the best, and most expensive. Yaesu rotators are the most commonly used aiming systems, but they're not cheap. The G-5500 AZ-EL rotator system goes for \$650, but it will accurately position the largest hamsat array. My system includes an Alliance azimuth rotator and an older KLM elevation unit. I make a lot of satellite contacts. and it all works.

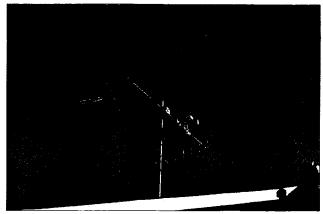


Photo C. The satellite antenna array at W5ACM has beams on two meters, 70 cm, and 23 cm, a semi-dish on 13 cm, and a 15-meter rotatable dipole.

Tracking

Over the last few months I have been using "freeware" on my PC to track the hamsats, GrafTrack II and Silicon Ephemeris from W5SXD and WB5CCJ can be used on almost any PC. The latest version can be downloaded from [http://www. rcallen.com]. I have mentioned this site and software previously, and for good reason. It works well and is verified as Y2K-compliant. I have it running on a 550 MHz Pentium III and on a really slow antique POQET pocket PC. I have no complaints. On the minus side, it is DOS-based software and you will have to read the manual to use it.

Do you have a Palm Pilot (III, V, or VII)? If so, you can get PocketSat shareware that will provide fast accurate aiming data from [http://www.palmgear.com]. I finally figured out how to update my satellite data for the latest NORAD element sets, and it's been great. The shareware version is limited to tracking five simultaneous satellites. while the registered version can keep up with more than you will need. The registered version costs \$12.50 from Palmgear (URL above). Neither version will calculate passes for high, elliptical orbits (like AMSAT-OSCAR-IO), but the software works fine with all the LEO (low Earth orbit) satellites.

On the air

For the last few months, I have provided a chart of orbits for AO-27. Now it's time for you to do your own tracking predictions. Try it. Check last month's column for more details on the mechanics of AO-27 chasing and investigate information from AMSAT, The Radio Amateur Satellite Corporation [http://www.amsat.org].

The big news

Phase 3D, the flagship project from AMSAT organizations around the world, has a launch commitment. Arianespace has announced that P3D is scheduled for a ride on Ariane flight 507 in July or August. We've been waiting for this for a long time. P3D is in French Guiana, and it's ready to go up. We're ready. Are you?

Wattmeter Winner

continued from page 31

power is exceeded. The third error displays if the reverse power level is greater than the forward power level.

I enjoyed building the kit and recommend it to anyone who is looking for something different to build. I look forward to many years of use. I have had very good success with both my LDG autotuner and my LDG QRP autotuner. I'm looking forward to seeing what pops up next in their accessory line!

For further details and pricing information, contact LDG Electronics, 1445 Parran Road, St. Leonard MD 20685. USA; tel.: (410) 586-2177; fax: (410) 586-8475; E-mail: [ldg@ldgelectronics. com]; Web site: [http://www.ldgelectronics. com/index.html].

Borrow money from pessimists—they don't expect it back.

Radio Direction Finding

Joe Moell P.E. KØOV P. O. Box 2508 Fullerton CA 92837 [Homingin@aol.com] [http://www.homingin.com]

T-Hunting for ELTs

"We're practicing a search-and-rescue technique, officer!" That's how I tried to explain why my van was parked in front of three NO PARKING signs at the end of a winding street near Turnbull Canyon Road in rural Los Angeles County one Saturday night last year. Just a hundred feet beyond the locked fire road gate in front of the van was my half-watt transmitter and 11-element two-meter beam, scattering signals through the Rose Hills. Ten miles away in Fullerton, a half dozen cars full of radio direction finding (RDF) enthusiasts were trying to get bearings on it.

The nearest house was almost a quarter mile away, so the main purpose of the county's NO PARKING signs was to keep teenagers from gathering at the gate for stargazing and necking. Since my van, bristling with antennas, was probably a more powerful deterrent to party-seeking teens than a few NO PARKING signs, this officer decided to let us stay. It probably wasn't the first time he had encountered hidden transmitter hunters. (We call ourselves T-hunters.) There have been three Saturday night T-hunts every month in southern California for the past twenty years, so we're well known.

Admittedly, public service is often just a noble-sounding rationale for RDF sports. However, a few of our participating teams are quite serious about the search-and-rescue (SAR) aspect. For instance, Bob Miller N6ZHZ and Cathy Livoni KD6CYG have traveled hundreds of miles at all hours to

locate dozens of aircraft Emergency Locator Transmitters (ELTs, see **Photo A**) in southern California, as described in this column back in April 1994.

Other T-hunters have found ELTs just by being in the right place at the right time and knowing what to do. (See KJ6HZ's story in "Homing In" for November 1998.) If someone told you that an ELT was transmitting nearby, would you be able to track it down? My mailbox has brought several recent reports of hams who were up to the task.

Air show action

Last September, Steve Whiteside N2PON of Liberty KS got an unexpected chance to put his T-hunting skills to work. He had flown to the Tulsa Regional Air Show in Bartlesville OK in a friend's Beechcraft Musketeer, carrying his new Yaesu Air Pilot hand-held aircraft band transceiver. During

final approach, the tower asked all pilots to check their ELTs, because an emergency beacon was being heard on 121.5 MHz.

"After parking. we started looking at airplanes and I forgot about the ELT signal," Steve wrote. "About noon, a gentlemen walked past us using his hand-held to perform a methodical, row-by-row search for the ELT. So I

turned on my radio and started casually looking also. Removing the antenna killed the signal completely, and holding my hand over the base of the antenna would also knock down the signal, but that did not seem like a reliable attenuator.

"There were about a hundred show planes parked in the area," N2PON continued. "With no directional antenna, no attenuator, no S-meter, and a new, unknown radio, I was not very optimistic about locating the ELT. After some erratic scarching. I remembered the 'body fade' technique. Standing between the rows of airplanes with my hand-held pressed against my stomach, I rotated to find the null. The ELT should then be behind me. The nulls were not consistent in direction, due to all of the reflections from people and airplanes, but I kept at it.

"Soon I could not get any null at all as I rotated my body. Then I remembered to tune off-frequency to attenuate the signal. Tuning to 121.400. I found a strong signal near two airplanes. The owner of one checked both his ELT and his neighbor's. They were OK.

"Moving farther up this row of airplanes, I had to tune further off frequency. As I reached the last aircraft in the row, I was tuned to 120.600 MHz and heard the signal. Upon checking at my request, the owner found that his ELT was on! Stowing baggage under the seat had probably tripped the switch.

"The total time I spent hunting was just twenty minutes. The new radio made the hunt more difficult because I did not yet know how it performed. Not having any RDF equipment available was discouraging, and I did not really expect to succeed. In retrospect, it's clear to me that the experience I gained by participating in the New Jersey

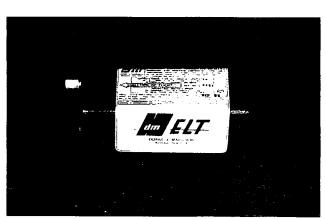


Photo A. This Emergency Locator Transmitter (ELT) mounts in the tail of a small plane and activates on impact. (Photo by Tom Curlee WB6UZZ)

10-70 club foxhunts enabled me to locate this ELT so quickly." Nice work, Steve!

The vast majority of ELT activations are accidental (Photo B), but these falsely triggered units have to be found and turned off quickly so that they do not cover signals from ELTs activated by genuine emergencies. And when such emergencies occur. haste is vital. ELT batteries may last only a few hours. Such was the case in western Massachusetts on October 5.

A mountain rescue

Timothy Ertl KE3HT of Dalton MA is one of several hams who are members of the Berkshire Mountain Search and Rescue group (BMSAR). At 0830 that day, he was called by fellow BMSAR member Don Horton N1ISB for possible participation in the search for a twin-engine Beechcraft King Air 200, believed to have crashed on Mount Berlin near Williamstown.

Massachusetts State Police, the agency in charge of the search, didn't officially activate BMSAR until 1100. As instructed, Tim, Don, and Ed Grosso N1FGY went to the Williamstown Fire Station to sign in and be transported by police all-terrain vehicles (ATVs) into the search area with their on-foot RDF gear.

"My portable 5-element beam was a bear to handle and still be able to hold on to the vehicle frame." Tim wrote about his ATV ride. "Our trip up the mountain had a few obstacles to overcome. The first was a bridge out, which required the ATVs to make a river crossing along some rocks, then climb the other side of the river bank. I took the chicken way out and crossed on foot. Then we had a couple of trees in the logging trails to go around, but we did not stop until we were facing an uphill slope that the ATVs could not climb.

"Out on foot, Ed took the south ridge, I took the center ridge, and an officer with no RDF equipment took the north ridge. Ed's receiver heard a rise in the noise, which is characteristic with AM signals, to his north. I was too close to the shadow of my ridge to hear anything, but I confirmed the position of Ed. My police officer used his compass to figure out which way was north of Ed. The officer to our north went farther north and picked up the scent of aircraft fuel. That led to the helicopters circling him, and the plane was spotted at about 1530 hours."

Unfortunately, the two men aboard the plane had been killed instantly in the crash. Nevertheless, the three BMSAR hams received praise from the State Police and a thank-you E-mail from a close friend of the passenger.

"We should have been started earlier in the morning," Tim added. "Then we would have gotten better bearings before the ELT battery ran down. The signal was almost gone by the time they actually got to the plane.

"Sometime in February, Don and I are going to give a presentation to the State Police," KE3HT concluded. "We'll cover what transmitter hunters can do not just finding ELTs, but other services. We're also going to ask if they

can notify us earlier, so we can start helping before the public is notified. We'll probably have to agree not to discuss our activities in detail on wide-coverage repeaters. They don't want a bunch of news reporters hearing us and running into the hills, messing up the scene."

Practice pays

Other groups like BMSAR know that preparedness and training make it possible to be successful in operations like this, especially when the distress signal is weak

Photo B. It's that one! Steve Kirkman KB6IMB (left) and Jim Frank KB6ONC of the Los Padres Search and Rescue Team use their RDF set to find a squawking ELT at the Santa Barbara airport. (Photo courtesy of Lou Dartanner N6ZKJ and Austin Rudnicki K6IA)

and erratic. Regular practice sessions can keep skills sharp and camaraderie high.

A recent practice event put on by the South Shore Foxhunters, a group on the other side of Massachusetts, was particularly well done. At 0900 on November 7, members met at headquarters of the Myles Standish State Forest. They were told that several people were hidden in the forest and that both the foxhunters and other SAR volunteers would try to find them. The major



Low Power Operation

Michael Bryce WB8VGE SunLight Energy Systems 955 Manchester Ave. SW North Lawrence OH 44666 [prosolar@sssnet.com]

The Jersey Fireball 40

Every Novice knows that power is equal to voltage times current. So, a standard red LED will light up when two volts at 22 mA is applied to it. The total power required is about 44 mW. Give or take a milliwatt or two. That's not much power in anyone's book. But, on the other hand, I've talked to truck drivers using a signal generator, but that story is for another time.

an you make a contact using 40 mW? Yup! Sure can! It's easy? All together now. can you say "frustration?" One of the hardest things to do when running milliwatts is finding out how many of them are being sent to the antenna. Sure, you can turn the power down on the ol' QRP rig, but most wattmeters cough and gag at power levels of less than one watt. There are two ways to do real milliwatting. One is to use a step attenuator. like the one for the Ten-Tec Argonaut II. Or to use a rig that will produce only milliwatts! You can't be tempted to crank up the power if you don't have the juice to crank up.

Meet the Jersey Fireball 40 transmitter

If you want milliwatts, then the Jersey Fireball 40 is a simple and easy-to-build ultra low power CW transmitter. On a really good day, this guy will squirt out 40 that's right, 40 milliwatts — to the antenna. The Jersey Fireball 40 is the product of Clark Fishman WA2UNN, A sadist at heart, he designed the Jersey Fireball 40 to cover one of four possible bands. You can configure the Jersey Fireball 40 to work at 28.322 MHz, 14.160 MHz, 7.080 MHz, or 3.540 MHz. The Jersey Fireball 40 basic kit comes with the necessary parts for 40-meter operation. If you want to change bands, you select the correct jumper and then add the necessary filter components. The frequencies the Jersey Fireball 40 operates on are not easily changeable, but still very useful nonetheless. The reason? The Jersey Fireball 40 uses a TTL crystal oscillator "can" for the frequency-controlling component. You can only change frequency by changing the "can."

Here's how it works

The Jersey Fireball 40 uses the TTL 56 73 Amateur Radio Today • May 2000

oscillator frequency of 28.322 MHz. The output of the oscillator can is directed into two 74LS74 chips. Each one will divide the output of the TTL oscillator by two. So, 28.322 divided by 2 is 14.161 MHz. Divide this frequency again by two, and the results are smack in the high end of the 40 meter CW band, or 7.080 MHz. One more division by two, and whoa! You're looking at 80 meters with 3.540 MHz. For the tenmeter purist, the can is run straight through. The output of either the can (on ten meters) or one of the other frequencies is filtered by a 5-element elliptical filter. As I said, everything is set for 40 meters.

Keying of the Jersey Fireball 40 is done by grounding the TTL oscillator. I found the keying to be a bit hard, but that's OK, too. You kind of want the keying to be a little on the hard side, so your signal stands out from the birdies in the guy's receiver.

The entire Jersey Fireball 40 is operated from a +5 volt supply provided by the onboard LM78L05Z regulator. The input voltage can be anything from 9 to 14 volts. A nine-volt transistor battery would be an ideal power source for the Jersey Fireball 40.

Options galore

Just like an SUV, you can get the Jersey Fireball 40 loaded with two very important options. First, you can add the TiCK keyer. The TiCK is a slick super-small iambic keyer on a chip. There's a PGM connector on the bottom of the PC board for controlling all the magic the TiCK keyer will do.

The other option is the one I installed. It's the one-watt amplifier! Now, I am going to sound like my buddy Randy KD8JN, and say I only turned it on when I needed to. But that one watt is a hell of a kick from 40 milliwatts. The amplifier uses a 2N2222A transistor.

Building the Jersey Fireball 40

The Jersey Fireball 40 is assembled on a double-sided PC board. The board measures 2" x 3". There is no silk-screen, but some of the part locations are etched into the board. You get just the basic components for the 40-meter band. Also missing are the amplifier parts, and of course the TiCK keyer.

Assembly is quick; most of the active parts are IC chips. You need to wind the filter toroids and install the various capacitors for the filters. You should be able to stuff the PC board, wind the coils, and put it on the air in less than two hours.

You'll need some sort of T/R switching. The Jersey Fireball 40 does not have any means of switching the antenna from the receiver to the Jersey Fireball 40. There is no sidetone, either. I used the T/R controller I did several years ago. As for a receiver, my old Heathkit HR1680 worked for me.

Testing

About the only thing you have to do is to check your work on the PC board, and apply power. Be sure you have the output into a 50-ohm load, and key the rig. You can listen to yourself on a receiver. The keying should be nice and clean, if it is a bit too hard for your liking, you can add a .01 capacitor to the key line to soften the keying up. That's about the only thing you have to do to get this guy on the air.

How does it work?

Well the Jersey Fireball 40 works just great on the test bench. Making QSOs with it is another matter. Oh, don't misunderstand

Mobile, Portable and Emergency Operation

Steve Nowak KE8YN/4 1011 Peacock Ave. NE Palm Bay FL 32907-1371 [ke8yn@netzero.net]

Good Operating, and a New Headset on the Block

There are two things in particular that make writing this column so much fun. The first is the chance to meet great people with whom to share ideas, and the second is the chance to play with some great toys. This month I've had a chance to do both, and both may well improve my operating ability.

couple of issues back, I wrote about the fun of ten meter FM. I included a chart showing some of the frequencies in common usage. Of course, the fact that a frequency is in common use for a particular purpose does not mean that it in fact should be used for that purpose. One frequency that is commonly used for simplex communications, 29.480 MHz, should not be used for 10 meter FM since it is primarily used for satellite communications. I received a note from K5OE by E-mail pointing this out, and he mentioned that this use was listed in the Courteous Operator's Guide. Thanks for the heads up, Jerry.

Jerry's message got me to thinking about some of the real advantages of this hobby. As a group we tend to look at one another as compatriots. We also tend to try to work things out among ourselves rather than waste a lot of effort assigning blame. These civilities were once more common and are still the norm among hams, which says a lot about us as a group. Although we are governed by the FCC rules and regulations, we also adhere to our own guidelines, which are often referred to as "Good Amateur Practices." These include routine courtesies and the ARRL's Amateur's Code. We do these things not because we are forced to, but because it makes for a better hobby.

While it's always easy to point out what "they" should do to make this a better hobby, it's a little harder, although more productive, to determine what "we" should do. In my case, I decided to do the following:

Take the time to re-read the Amateur's Code (found in the ARRL Handbook). This code lists six key concepts: The amateur is Considerate, Loyal, Progressive, Friendly, Balanced, and Patriotic. Sometimes these old-time values are the best guide.

Review Part 97, the regulations that govern Amateur Radio. Even without the license restructuring, there were some changes with which I was not as familiar as I should have been. There are a number of Web sites that provide current copies of the rules, including the league's home page [www.arrl.org].

Keep a copy of the Courteous Operator's Guide near my rig (and my word processor) — and double check it for competing uses of a frequency!

Make sure that I think to check my transmitter output. Am I only using the minimum power for the QSO in which I'm engaged? And, finally, I'm going to consciously pause before pressing the push-to-talk button to give someone else a chance to call, particularly on 2 meters. After all, there rarely is something so important that I have to say that it can't wait for an additional second or two.

It's always possible to do something just a little better, and doing it better should be

no inconvenience when it involves something as enjoyable as this hobby. I'm going to do these things now to improve my operating, and also I'm going to do a selfcheck every so often just to see what other areas I can be better at. Any ideas you might have to improve the hobby? Drop me a note.

A few months ago, I was involved in helping the hospital where I work coordinate some emergency communications plans. Since there is the distinct risk of flooding due to tidal surge during hurricanes, the contingency plans include provisions for all critical departments located on the first floor to be relocated to higher ground. The telephone switchboard, for example, has a backup location on the second floor. This backup location is planned as a communications hub with telephone equipment as well as antenna connections for two hospital radio systems, the county emergency radio system, and the two meter amateur band. Since the room is rather small, I began to think of how noisy it would be if all these communicators were trying to do their jobs at the same time. Since losing the ground floor means that space would be at a premium, this may be the best or only location for a ham station. I realized that a headset with a boom microphone would prove



Photo A. Comfortable to wear and featuring clear audio, the Warren Gregoire TR-2000 headset has a noise-canceling microphone and either PTT or foot switch for transmitting. KE8YN/4 models.

Listings are free of charge as space permits. Please send us your Calendar Event two months in advance of the issue you want it to appear in. For example, if you want it to appear in the August issue, we should receive it by May 31. Provide a clear, concise summary of the essential details about your Calendar Event.

MAY 6

CADILLAC, MI The Wexaukee ARC will hold their Annual Amateur Radio and Computer Swap Meet on Saturday, May-6th, from 8 a.m. to 1 p.m., at the Cadillac Jr. High School. Talkin on 146.98 rptr. Free parking. Admission is \$5. Tables \$8 for an 8 ft. table. For table info contact NUBL, (231) 862-3774; or E-mail [amcconnell3@hotmail.com]. There will be VE exams at 10:30 a.m. Contact WABLKV, (231) 829-3433 or E-mail [avanant@netonecom.net]. You must pre-register for testing.

CEDARBURG, WI The Ozaukee Radio Club will sponsor its 22nd Annual Cedarburg Swapfest, 8 a.m.–1 p.m. at the Circle-B Rec. Center, Highway 60 and County I (located 20 miles north of Milwaukee, west of Grafton). Admission \$4, both in advance and at the door. 4-ft. tables are \$5 (limited power on request). Seller's setup at 6:30 a.m. VE exams start at 9 a.m. Talk-in on 146.37/.97 and 146.52. For tickets, table reservations, maps or more info, send an SASE to Joe Holly, ORC Swapfest Chairman, 1702 Holly Lane, Grafton WI 53024. Tel. (262) 377-2137.

SILOAM SPRINGS, AR The Siloam Springs ARC Hamfest and Flea Market will take place at St. Mary's Catholic Church at 1996 Hwy. 412 East in Siloam Springs AR. Hours are 8 a.m.-3 p.m. Talk-in on 146.67. Computer seminars will be held during the hamfest. Contact Matt Hyde N5UYK at (501) 524-4797.

OWEGO, NY The Binghamton ARA will host the 2000 Owego Hamfest, May 6th, starting at 8 a.m., at Tioga County's Marvin Park Fairgrounds. Setup for vendors and tailgaters at 6 a.m. Indoor vendors who require Friday setup, call ahead of time. Admission \$5. Tailgate spots \$2. Indoor tables \$10 ea. VE exams will be conducted in a quiet setting at the school next door. For more info, or to reserve an inside table, *E-mail [rmess@binghamton.edu]*; or call Bill Coleman N2BC, (607) 748-5232; or write to BARA, P.O. Box 853, Binghamton NY 13902-0853.

MAY 6-7

ABILENE, TX The Key City ARC will sponsor their 15th annual Hamfest at the Abilene Civic Center from 8 a.m.–5 p.m. Sat., May 6th, and from 9 a.m.–2 p.m. Sun., May 7th. Free parking. VE exams. Wheelchair access.

Limited RV parking for a nominal fee. Tables \$6 each. Pre-registration \$7 (must be received by May 1st), \$8 at the door. Talk-in on 146.160/.760. For reservations and info contact *Peg Richard KA4UPA*, 1442 Lakeside Dr., Abilene TX 79602; tel. (915) 672-8889. E-mail [ka4upa@arrl.net].

MAY 7

HAGERSTOWN, MD The Antietam Radio Assn., Inc.'s 8th Annual Great Hagerstown Hamfest & Computer Show "The Millennium Hamfest" will be held at Hagerstown Community College Rec. Center. From Interstate 70, take Exit 32B to Edgewood Dr. (Home Federal bank on right). Turn right. Drive 1.4 miles. Entrance to the college is on the left. Follow signs. From the north or south, take Interstate 81 to Interstate 70 East, Follow directions as above. Talk-in on 146.94 and 147.09 rptrs. (W3CWC). Gates open at 6 a.m., building opens at 8 a.m. General admission \$5, children 12 and under free. Tailgating is an additional \$5 per space on an asphalt tailgate area. New and used computers and supplies, and ham radios will be the featured items. VE exams by the ARRL VEC Team, on the 2nd floor of the Rec. Center. Walk-ins OK at 8:30 a.m. For more info contact Greg Lanham WA4VE, (540) 772-4792. E-mail [kuan@visuallink.com]. There will be an ARRL forum at 10 a.m., and an ATV forum at 11 a.m.

YONKERS, NY The Metro 70cm Network, WR2MSN, will sponsor a Computer and Electronic Flea Market, May 7th, at Lincoln High School, Kneeland Ave., Yonkers NY, starting at 9 a.m. Vendors setup at 7 a.m. Free parking. Admittance \$6, under 12 years free. Talk-in on 440.425 PL 156.7 and 146.910 PL 114. Vendors, call WB2SLQ after 7 p.m. at (914) 969-1053; or E-mail [Wb2slq@juno.com] to register. The Metro 70cm Network is an emergency communications network covering 4 states.

MAY 20

FORESTDALE, RI The Rhode Island Amateur FM Repeater Service, Inc., which operates the 146.76, 146.94, 223.76 and 447.425 repeaters in Rhode Island, will hold their annual Spring Flea Market and Auction at the VFW Post 6342, Main Street, Forestdale (No. Smithfield) RI on Saturday, May 20th. Take the Forestdale exit off Route 146 in No. Smithfield; take a left

at the end of the ramp and go six tenths of a mile to the Post on your right, just before the Village Haven Restaurant. Please observe parking instructions. The flea market opens at about 8 a.m. and spaces are \$5 each. Some spaces are available under the pavilion on a first-come, first-served basis. The auction will be held 11 a.m.—3 p.m. Talk-in on 146.76. For more info, contact Rick Fairweather K1KYI, 106 Chaplin St., Pawtucket RI 02861; tel. (401) 725-7507 between 7 and 8 p.m. only. E-mail [k1kyi@arrl.net].

MAY 21

FAIR OAKS, CA The North Hills Radio Club of Sacramento CA will hold its annual Swapmeet at Bella Vista High School, 8301 Madison Ave., Fair Oaks CA. From I-80 (Sacramento-Roseville), go east on Madison Ave. for 5.8 miles to the high school on the left. From Hiway 50, go north 2.6 miles on Hazel Ave. to Madison Ave.; turn left onto Madison Ave. for 1.4 miles. The school is on the right. Seller spaces (2 car stalls) are \$10. Free parking for buyers. For more info contact Earl S. Mead K6ESM, (916) 331-1115; or E-mail [nhrc@k6is.org]. Check the Web at [http://www.K6lS.org].

MAY 26-27

PASCAGOULA, MS The Jackson County ARC will hold its 6th annual Hamfest in the Civic Center at the Jackson County Fairground, 5 p.m.-9 p.m., Friday May 26th; and 8 a.m.-2 p.m. Saturday, May 27th. Talk-in on W5WA 144.510/145.110. Dealer setup begins on Friday at noon. Tickets are \$2.50, no more than \$10 for immediate family. Tables \$8/8 ft. table. RV parking available on site. VE exams 11 a.m. Saturday. The test fee is \$6.65 and it is mandatory that you bring a picture ID, your original license and license copy. No charge for Novice testing. E-mail [montehat@ datasync.com] or [irag@mindspring.com] to request a flyer. For more info contact Hamfest Chairman Charles F. Kimmerly N5XGI, 19000 Busby Rd., Vancleave MS 39565. Tel. (228) 826-5811.

MAY 28

WEST FRIENDSHIP, MD A Hamfest will be held by the Maryland FM Assn., at Howard Co. Fairgrounds, 8 a.m.–2:30 p.m. Take I70 to Rte. 32, S to Rte. 144; turn right, go W on Rte. 144,

approx. 1 mile to the fairgrounds. Talk-in on 146.76, 224.76, or 444.00. Admission \$5. Tables \$20 in advance, \$25 at the door. Tailgate space is \$5 per space. For reservations, contact *Mike WA3TID, P.O. Box* 19, Annapolis Junction MD 20701. Tel. (410) 923-3829.

JUN 3

GRAND RAPIDS, Mi The annual IRA Hamfestival, West Michigan's largest hamfest, will be held at the Hudsonville Fairgrounds near Grand Rapids, Talk-in on 147.16 link rptr. system. Doors open at 8 a.m. for general admission. Free parking. Dealers can setup on the 2nd after 7 p.m., or after 6 a.m. on the 3rd. Bring your ham equipment, coax, computer equipment, software, books, wire, iewelry, sweat-shirts etc. to sell. Hams, bring your used equipment to trade or sell. Computer hobbyists, bring your excess hardware, software, books, etc. to trade or sell. Overnight camping is available, \$10, VE exams at 10:30 a.m. Indoor table space, 8 ft. tables \$8 each. 10 ft. trunk sales spaces, \$6. Contact Kathy at (616) 698-6627 from 4 p.m. to 7 p.m. EST. Visit the Web at [http://www.iserv.net/~w8hvg].

SPRINGFIELD, IL A Hamfest will be held June 3rd at Illinois State Fairgrounds. Enter Gate 11. This event is being co-sponsored by Sangamon Valley Radio Club & Shooting Stars 4-H Club. Talk-in on 146.685(-). Flea market opens at 6 a.m.; building opens at 8 a.m. Tables \$5 in advance. Admission tickets \$5 each. No extra charge for covered flea market spaces. ARRL VE exams. For more details contact Ed Gaffney KA9ETP, 13977 Frazee Rd., Box 14A, Divernon IL 62530. Tel. (217) 628-3697; or E-mail to [egaffney@family-net.net].

JUNE 4

MANASSAS, VA The Ole Virginia Hams ARC, Inc., will hold Virginia's Olde Fashioned Manassas Hamfest at Prince William County Fairgrounds, 1/2 mile south of Manassas VA on Route 234. Talk-in on 146.97(-), 224.660(-), and 442.200(+). Indoor exhibitor space, 8 ft. tables \$30 each, with chairs and electricity. Setup 2 p.m.-10 p.m. Saturday, General admission is \$5 per person at the gate. No advance sale. Gates open at 7 a.m. Free parking. Tailgating \$5 per space (plus admission), Gates open at 6 a.m. Setup 2 p.m.-10 p.m. Saturday. Find directions, details, and hotel info at the Web site [http://www.qsl.net/ olevahams]. Dealers, contact Jack N4YIC, (703) 335-9139; Fax: (703) 330-7987; E-mail [N4YIC@arrl.net] or [patnjack@erols.com]. For general info, contact Mary Lu KB4EFP, tel. (703) 369-2877; E-mail [mblasd1638@aol.com].

QUEENS, NY The Hall of Science ARC Hamfest will be held at the New York Hall of Science parking lot, Flushing Meadow Corona Park, 47-01 111th St., Queens NY. Doors open

for vendors to set up at 7:30 a.m. Buyers admitted at 9 a.m. Free parking. VE exams at 10 a.m. Admission by donation, buyers \$5. Sellers \$10 per space. Talk-in on 444.200 rptr, PL 136.5; 146.52 simplex. Contact (eves. only) Stephen Greenbaum WB2KDG, (718) 898-5599. E-mail WB2KDG@Bigfoot.com] or Andy Borrok N2TZX, (718) 291-2561; E-mail [N2TZX@webspan.net]. For info about the VE exams, contact Lenny Menna W2LJM, tel. (718) 323-3464, or E-mail [LMenna6568@ aol.com].

SPECIAL EVENTS, ETC.

MAY 5-7

MARTHA'S VINEYARD ISLAND, MA The Fall River ARC will operate W1ACT portable from the Gay Head Lighthouse on Martha's Vineyard (IOTA NA-046). Frequencies: 14.260, 21.260, 28.460 and 146.55 MHz. Operation will start May 5th at 18:00 UTC and end May 7th at 21:00 UTC. Please QSL SASE via N1JOY.

MAY 6-7

CONNECTICUT QSO PARTY The Candlewood ARA will sponsor the Connecticut QSO Party 2000Z May 6th-2000Z May 7th, with a rest period 0400Z-1200Z.

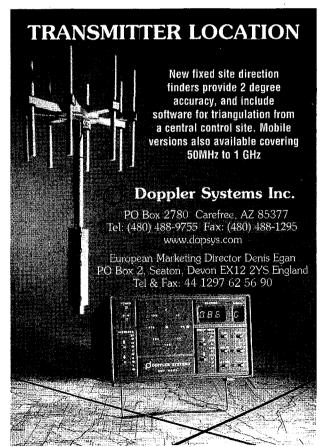
Phone, RTTY and CW. Work stations once per band and mode, mobiles as they cross county lines. No repeater QSOs. Single operator, fixed/mobile, Novice, QRP (5W), Multi-single Multimulti classes plus Connecticut club competition. Connecticut stations may contact other Connecticut stations for QSO/multiplier credit. Connecticut stations exchange report and county: others exchange report and state/ province/DXCC country. Non-CT stations work CT stations only. CW -40 kHz up from lower band edges; Novices 25 kHz up from low end. Phone-1.860, 3.915, 7.280, 14.280, 21.380, 28.380, VHF **—** 50.150, 144.200, 146.580. RTTY -Normal RTTY bands. All bands (HF, VHF, UHF) except WARC bands count. Score one point per phone QSO and two points per CW or RTTY QSO. QSOs with club station W1QI and ARRL HQ station W1AW count 5 points. Connecticut stations multiply QSO points by states/provinces/CT counties worked (DX only one multiplier); others multiply by CT counties worked (work CT stations only). Plaques and certificates (100 point minimum). Special certificate for working all 8 Connecticut counties. Send entry and SASE for results by June 7th to CARA, P.O. Box 3441, Danbury CT.06813-3441.

MAY 20

WINFIELD, IL The DuPage ARC, in commemoration of Armed Forces Day, will operate Special Event Station W9DUP, 1630Z May 20th—2300Z May 20th. Operation will be on 7.250, 14.290, 28.400 and 145.25/144.66 MHz. Stations may request a certificate. QSL with an SASE to John McCarty N9HRT, DuPage ARC, P.O. Box 71, Clarendon Hills IL 60514.

Back Issues

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CIRCLE 13 ON READER SERVICE CARD

Jim Gray W1XU/7 210 E Chateau Payson AZ 85541 [jimpeg@netzone.com]

Unusual Activity and a Conjunction, Too!

You can expect some exceptional solar activity accompanied by severe ionosphere and magnetic field disturbances during the second and fourth weeks of this month.

In fact, it is possible that intense aurora will occur around the 8th and 24th of this month, whereas the first and third weeks are expected to provide Fair to Good propagation conditions on the HF bands. Check the VHF bands during the second and fourth weeks for unusual activity and some long-haul DX on six meters during a few days. We are now approaching the solar maximum of Cycle 23 and the summer solstice, whose

effects combine to provide the unusual activity described this month.

Please be aware that extreme weather and possibly other severe geophysical upsets may be expected in the northern

	May 2000										
SUN	MON	TUE	WED THU		FRI	SAT					
	1 F	2 F-P	3 P-F	4 F	5 F-P	6 P					
7 P-VP	8 VP	9 VP-P	10 P	11 P-VP	12 VP-P	13 P-F					
14 F	15 F-G	16 G	17 G	18 G	19 G	20 G					
21 G-F	22 F-P	23 P-VP	24 VP	25 VP-P	26 P	27 P-F					
28 F	29 F	30 F-G	31 G								

EASTERN UNITED STATES TO:												
GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	10/12		20				17/20	20			15/17	10/12
ARGENTINA	15/17	15/17	20	30/40	30/40			10/12			12/15	12/15
AUSTRALIA	10/12	17/20	20	20	20	30/40	30/40	17/20				10/12
CENTRAL AM.	15/17	17/20	17/20	17/20	17/20	15/17	15/17	10/12	10/12	10/12	17/20	10/12
ENGLAND	17/20	30/40	40/80	40/80	30/40			15/17	10/12	15/17	15/17	17/20
HAWAII	10/12	12/15	17/20	17/20	20/30	20/30	17/20	17/20				10/12
INDIA	17/20	17/20						15/17				
JAPAN	10/12		17/20				17/20	17/20			15/17	10/12
MEXICO	12/15	20/40	20/40	20/40	20/40	15/17	15/17	10/12	10/12	10/12	17/20	10/12
PHILIPPINES	15/17		17/20	17/20			17/20	15/17	10/12			15/17
PUERTO RICO	15/17	17/20	17/20	17/20	17/20	15/17	15/17	10/12	10/12	10/12	17/20	10/12
RUSSIA (C.I.S.)	30/40	30/40	17/20	17/20				10/12	10/12	12/15	17/20	17/20
SOUTH AFRICA	20/30	40	20/30	20/30					10/12	10/12	12/15	12/15
WEST COAST	20/30	20/30	20/30	30/40	30/40	, i		10/12	10/12	10/12	15/17	17/20
	CENTRAL UNITED STATES TO:											

	7		_	_		_	_	_				
ALASKA	10/12	12/15	17/20	17/20	20		17/20	17/20				10/12
ARGENTINA	15/17	15/17	20/30	20/30	17/20			10/12			10/12	12/15
AUSTRALIA	10/12	15/17	15/17		17/20	20/30	30/40	17/20			12/15	10/12
CENTRAL AM.	15/17	15/17	17/20	17/20	20/30			10/12	15/17	10/12	10/12	10/12
ENGLAND	30/40	30/40	30/40						12/15	12/15	17/20	17/20
HAWAII	12/15	15/17	15/17	17/20	17/20	20/30	30/40	17/20		10/12	12/15	12/15
INDIA	15/17	17/20						12/15	12/15			
JAPAN	10/12	12/15	17/20	17/20	17/20		17/20	17/20				10/12
MEXICO	10/12	15/17	17/20	17/20	17/20			10/12	10/12	10/12	12/15	12/15
PHILIPPINES	10/12		15/20	17/20					10/12	10/12		
PUERTO RICO	15/17	15/17	20/30	20/30	20/30			10/12	10/12	10/12	10/12	10/12
RUSSIA (C.I.S.)								12/15	12/15	12/15	17/20	17/20
SOUTH AFRICA	1		17/20	17/20					12/15	12/15	15/17	17/20
MEGTERN UNITED GTATES TO												

WESTERN UNITED STATES TO:												
ALASKA	10/12	10/12	15/17	17/20	17/20	17/20		17/20	17/20			15/17
ARGENTINA	10/12	12/15	15/17	17/20	17/20						10/12	10/12
AUSTRALIA	10/12	12/15	15/17	15/17	17/20	17/20	17/20		17/20			
CENTRAL AM.	10/12	12/15	15/17	17/20	30/40	·			10/12	10/12	10/12	12/15
ENGLAND	17/20	17/20							15/17	15/17	17/20	17/20
HAWAII	10/12	10/12	12/15	15/17	20/30	20/30	30/40		12/15	10/12		
INDIA	1	15/17	17/20						12/15	15/17		
JAPAN	10/12	10/12	12/15	17/20	17/20	17/20			17/20			15/17
MEXICO	10/12	12/15	15/30	17/30	20/30				10/12	10/12	10/12	12/15
PHILIPPINES	10/12	10/12						17/20	15/17	17/20		
PUERTO RICO	10/12	12/15	15/30	15/30	17/30				10/12	10/12	10/12	12/15
RUSSIA (C.I.S.)	17/20				17/20			17/20	17/20	20	20	20
SOUTH AFRICA	17/20	20		20						10/12	12/15	12/15
EAST COAST	20/30	20/30	30/40	30/40	30/40			10/12	12/15	12/15	15/17	17/20

hemisphere this month, particularly on the 8th–11th and the 23rd–26th.

For avid sky watchers and early risers, look for a Jupiter/Venus conjunction at sunrise on May 17th, but only 3 degrees above the horizon and 7 degrees from the Sun, making possible viewing difficult. On the evening of May 18th, Mars and Mercury will be close together, very low in the WNW after sunset, but could be masked by the Sun's glare. Forty minutes before local sunrise on the morning of May 28th, there will be a Jupiter/Saturn conjunction, but they could be too close to the Sun (15 degrees) and masked by solar glare. On the morning of May 31st at about 40 minutes before sunrise, there will be a Jupiter/Saturn/Moon configuration about 2 degrees above the horizon, with the Moon about 10 degrees to the upper right. Again, possibly difficult to see.

General band-by-band forecast:

10 and 12 meters

Fairly regular DX may be expected on Good (G) days to Europe and the East before noon, and to Africa shortly after noon. Also, you may find good band openings to South America, the Pacific, and the southern hemisphere during the afternoon. Short skip between 1,000 and 2,000 miles during the day is anticipated for most days.

15 and 17 meters

You can look for excellent daytime DX to the southern hemisphere and to most areas of the world, peaking to Europe before noon and to most other areas of the world during the afternoon; daytime short skip beyond 1,000 miles will be frequent.

20 meters

Excellent DX openings to most areas of the world are expected on Good (G) days

from local sunrise until long after sunset. Peak conditions should occur an hour or two after sunrise and again in the late afternoon. On Good (G) days, DX into the southern hemisphere can be worked during the hours of darkness as well. Short skip from 500 to over 2,000 miles is anticipated on most days.

30 and 40 meters

These may be your best DX bands from local sunset until sunrise, when you can expect frequent openings and often strong signals into the southern hemisphere. Daytime short skip to about 1,000 miles is expected, and beyond 750 miles after dark.

80 and 160 meters

Worldwide DX can be expected from local sunset through the darkness hours on Good (G) nights, limited of course by thunderstorm static on some paths. Short skip at night will extend between 1,000 and 2,000 miles.

When Less is More continued from page 13

about joining—to quote their pamphlet, CQC is "A Colorado club with Global Membership." Their bi-monthly magazine The Low Down is worth the subscription cost, and in fact you will often see it quoted in 73.

If you are a reader, you will find QRP columns in the major magazines, and a number of books are available from the usual sources.

Did I say we are a weird bunch? If I did, I meant inventive and playful. A few years ago a well-known QRPer, Chuck Adams K7QO (then K5FO,) decided that QRP-L members should get away from their computers and onto 40M once in awhile, so he invented the "ORP-L Fox Hunt." A single station is "the Fox" for two hours, and everybody else tries to work him, or "bag a Jox pelt." The Fox Hunt has become an annual event, with Fox operations twice a week through the winter. I had the honor to be a Fox a few weeks ago, and believe me, you haven't worked a pileup until you have had 150 or more stations calling you within the space of two or three kHz. They are all QRP, but many of them have signals of S-9 or better, and the "baying of the hounds" is

just amazing. Sustained CW QSO rates of better than one per minute are quite common, and in my two hour stint I worked stations in 42 states.

A few weeks ago someone on QRP-L commented on the "elitism" of the First Class Operators Club, and the immediate result was the formation of the Second Class Operators Club, complete with motto "AGN?," member numbers, and a contest last weekend.

My point is that QRPers, while very skilled, dedicated, and inventive, are always mindful that the hobby should be fun. They do a darn good job of keeping it that way.

It's difficult to do a general article on QRP because the topic is so broad. In "traditional" ham radio we have special interest categories for antennas, construction, design, contesting, DX, awards, emergency communications, and so on. You can put QRP in front of every one of those topics, and it's only a slight reduction in scope, if any. I've written nearly as much as a Wayne Green editorial here, and kept pretty much on the single track of "QRP," yet I've barely scratched the surface. And at the best of times words can only covey so much. so why don't you try turning down the wick and seeing what you can do with ORP ... and what ORP can do for you. It will be like discovering amateur radio all over again.

Exploring the Kenwood TM-D700A

continued from page 16

display, and their function is labeled on the screen. Want to check the input frequency of the station you are working — again the push of a single button. Power can be adjusted from a low level (5 watts) to a medium level (10 watts) to the full power of 50 watts on VHF or 35 watts for UHF.

Tone can be easily switched off, or by pressing the same button you can activate the tone to access your favorite repeater. Pressing that button again activates Continuous Tone Coded Squelch System (CTCSS) so that your receiver will only respond to signals that are transmitting the correct tone. A third time activates Digital Code

Squelch (DCS), which also allows you to ignore unwanted signals. The 1750 Hz tone used for European repeaters is also included. If you can receive a station but do not know what the tone requirement is for that station to accept your signal, this radio can even scan for the required tone. Any tone you can transmit can be detected by scanning, including CTCSS or DCS codes, which is a tremendous benefit while traveling. I like to have repeaters identified along my planned route, and if a tone has been added or changed since the last repeater directory entry, this feature is essential to accessing the repeater.

Speaking of repeaters, this unit can even be set to automatic simplex checker so that it periodically checks the repeater input frequency on its own and gives you a visual indication if you are within range to work the other station simplex. If you are traveling in an unfamiliar territory, it's sometimes difficult to determine which repeaters listed in the directory are actually available and in use. The TM-D700A has a visual scan function that gives a graphic representation of the active frequencies in the area and their relative signal strength. By sliding a cursor to an indicated signal, you can monitor that frequency. No more random scanning in order to find which of the 27 repeaters in town are the popular ones.

Another very convenient feature of this radio is its programmable memory (PM) function. This permits you to save up to 5 configurations that maintain key information about your preferred settings. This could prove very useful if multiple people use the same radio so that each could have their own preferences automatically come into play with the push of a button. Likewise, you could have one PM setting for everyday use; a second for severe weather, a third for emergency or disaster services; a fourth for traveling; and still have one left over for your spouse.

I told you that it would take two issues to tell you about this radio. This month we scratched the surface of what Kenwood's latest offering can do. Next time, we'll look at all the special functions it can perform. In the meantime, if you get a chance to play with a TM-D700A, take advantage of it!

HOMING IN

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objective was to get as many of the searchers to the simulated crash site as soon as possible. This meant that cooperation among RDFers would be important, in distinct contrast to most competitive foxhunts.

"Sixteen South Shore foxhunters participated in this drill," wrote organizer Gil Follett WA1GDJ of Abington MA. "Brad Anselmo N1VUF gave pointers regarding what to do in an actual search and rescue, including how to handle an injured victim. Brad designated a special call-in frequency for when the victim was found, so that in a real situation there would be less chance of having that information broadcast prematurely by the media. He also cautioned that the victim's name should not be stated over the radio and that only pertinent general information (such as gender, age, and nature of injury) should be transmitted."

WA1GDJ had sectioned off the map into various quadrants so that searchers could proceed in an organized manner and attempt to triangulate on the signal from the foxbox/ELT. Carl Aveni N1FYZ was net control for the drill operations, using a base station on battery power running in the parking lot.

Within two and a half hours, all teams had found the foxbox and had practiced relaying information regarding injuries of the volunteer "victims," one of whom turned out to be Ritchy Guild KBIEAJ. Does this give you some ideas?

Pre-Y2K E-mail bugs

I enjoy getting your transmitter hunt reports and RDF stories, most of which now come via E-mail. I read every one and try to reply in a timely manner. Unfortunately, an E-mail problem arose in early November and took almost two months to overcome. It affects customers using one particular version of America Online software for Macintosh computers.

At first, AOL Tech Support claimed that the problem was entirely on users' computers, and insisted that I reload my software. After that didn't work, they agreed that it was a systemwide server problem and gave assurance that it would be fixed soon. A month and several phone calls later, the company admitted that there was no certainty that a timely fix was forthcoming. So I ended up having to change my software to another version, which necessitated hardware changes on one of my computers.

By that time, it was apparent that some incoming E-mail and files had been irretrievably lost. So if you sent E-mail to me

in the last two months of 1999, expected an answer and didn't get one, please try again now. And if you're not on E-mail, or have some great snapshots to contribute, then use my Post Office box, which has suffered from neglect since E-mail gained popularity.

ORP

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me, there's nothing wrong with the Jersey Fireball 40. It's trying to contact someone with 40 mW — that's the kicker. To complicate matters, you're rockbound, or should I say, "can bound." Finding someone calling CQ on 7.080 is asking for a lot! So, I did what Randy KD8JN does. I built the amplifier! But I only used it when I needed to!

The thinking went like this. I would make a contact with the one-watt amp in line. Then drop it out of line. In almost all cases, I was still S3 copy by the other station. Will I be able to work 5A1A? Nope! But even with Randy's SB-220 cooking, he was not heard by 5A1A either. So, it's not that much of a heartbreaker. I think Randy ended up using MCI to make a QSO with 5A1A! So it goes ... and that's another story, too.

Personally, with the Sun spotting up like a teenager's face on prom night, I would stick to either 10 or 20 meters. That's going to be your best bet for making QSOs. Remember that you'll have to supply your own parts for the output filter. Don't worry, the values are listed in the instructions.

Speaking of which, the instructions for the Jersey Fireball 40 are first-class. Not a Heathkit by any means, but clear and precise. You should not have any trouble assembling or troubleshooting your Jersey Fireball 40.

Where do I get my Jersey Fireball 40?

Glad you asked. The Jersey Fireball 40 is the product of the NJ-QRP club. The club is selling the basic 40-meter kit. including the PC board, for \$10. Write to NJ-QRP club. George Hern N2APB, 45 Fieldstone Trail, Sparta NJ 07871. Or visit their Web site at [www.njqrp.org]. E-mail: [n2apb@amsat.org].

Other goodies

If you plan on stuffing the PC board with the parts to use the amplifier, be sure you use a metal-case 2N2222. They seem to work better at RF than the plastic-case jobbies. Don't have TiCK keyer? Get yours from: Embedded Research, P. O. Box 92492, Rochester NY 14692. Web: [www.frontiernet.net/~embres/].

You might find this helpful, too: Extra Strength Tylenol, McNeil PPC Inc., Fort Washington PA. Or check your local Walgreen's or CVS. Running milliwatts is a challenge, but it can also produce headaches!

ON THE GO

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invaluable in a disaster support operation under these circumstances.

Now I have a selection of headsets, earphones, earplugs, etc., and there are advantages or disadvantages to each. I decided that the ideal system would be lightweight. comfortable, and provide good audio in both directions. For situations like this, it would be nice if it had some degree of noise cancellation. I remembered using a headset that met these characteristics as a pilot, and wondered if a similar unit was available which would work with my amateur radio gear. After all, there are few places noisier than the cockpit of a small piston-driven aircraft, and pilots depend upon their communication gear for more than just casual conversation.

The TR-2000 headset from Warren Gregoire Associates is just what the doctor ordered for this application. It was Warren's headset that I had relied on in the cockpit and, as it turns out, Warren is K6QX. I checked and found that Warren had a headset with a boom microphone specifically designed for amateur radio use. This headset weighs in at only 12 ounces so that it can be worn comfortably for long periods. The earpieces have padded earmuffs that significantly minimize background noise, and the padding on the earpieces and on the headband ensure a comfortable and secure fit. Since pilots tend to wear their headsets for long periods of time, their experience with aircraft gear has helped them to design a very practical and comfortable set. The boom microphone is spring-loaded and, once positioned, tends to stay where you want it. The electret element in the microphone draws its power from the microphone jack on most modern radios, or a battery if used with a vintage radio. The acoustic noise canceling design was developed for use in the aircraft cockpit and works well in other noisy environments. In other words, it's

Wise Up!

Here are some of my books which can change your life (if you'll let 'em). If the idea of being healthy, wealthy and wise interests you, start reading. Yes, you can be all that, but only when you know the secrets which I've spent a lifetime uncover-

.....Wayne

The Bioelectrifier Handbook: This explains how to build or buy (\$155) a little electrical gadget that can help clean the blood of any virus, microbe, parasite, fungus or yeast. The process was discovered by scientists at the Albert Einstein College of Medicine. quickly patented, and hushed up. It's curing AIDS, hepatitis C, and a bunch of other serious illnesses. The circuit can be built for under \$20 from the instructions in the book. \$10 (#01)

The Secret Guide to Wisdom: This is a review of around a hundred books that will help you change your life. No. I don't sell these books. They're on a wide range of subjects and will help to make you a very interesting person. Wait'll you see some of the gems you've missed reading, \$5 (#02)

The Secret Guide to Wealth: Just as with health, you'll find that you have been brainwashed by "the system" into a pattern of life that will keep you from ever making much money and having the freedom to travel and do what you want. I explain how anyone can get a dream job with no college, no résumé, and even without any experience. I explain how you can get someone to happily pay you to learn what you need to know to start your own business. \$5 (#03)

The Secret Guide to Health: Yes, there really is a secret to regaining your health and adding 30 to 60 years of healthy living to your life. The answer is simple, but it means making some difficult lifestyle changes. Will you be skiing the slopes of Aspen with me when you're 90 or doddering around a nursing home? Or pushing up daisies? No, I'm not selling any health products, \$5 (#04)

My WWII Submarine Adventures: Yes, I spent from 1943-1945 on a submarine, right in the middle of the war with Japan. We almost got sunk several times, and twice I was in the right place at the right time to save the boat. What's it really like to be depth charged? And what's the daily life aboard a submarine like? How about the Amelia Earhart inside story?If you're near Mobile, please visit the Drum. S5 (#10)

Wayne's Caribbean Adventures: My super budget travel stories - where I visit the hams and scuba dive most of the islands of the Caribbean. You'll love the special Liat fare which let me visit 11 countries in 21 days, diving all but one of the islands, Guadeloupe, where the hams kept me too busy with parties. \$5 (#12)

Cold Fusion Overview: This is both a brief history of cold fusion, which I predict will be one of the largest industnes in the world in the 21st century, plus a simple explanation of how and why it works. This new field is going to generate a whole new bunch of billionaires, just as the personal computer industry did. \$5 (#20)

Cold Fusion Journal: They laughed when I predicted the PC industry growth in 1975. PCs are now the third largest industry in the world. The cold fusion ground floor is still wide open. but then that might mean giving up watching ball games. Sample: \$10 (#22). Julian Schwinger: A Nobel laureate's talk about cold fusion-confirming its validity. \$2 (#24)

Improving State Government: Here are 24 ways that state governments can cut expenses enormously, while providing far better service. I explain how any government bureau or department can be gotten to cut it's expenses by at least 50% in three years and do it cooperatively and enthusiastically. I explain how, by applying a new technology, the state can make it possible to provide all needed services without having to levy any taxes at all! Read the book, run for your legislature, and let's get busy making this country work like its founders wanted it to. Don't leave this for "someone else" to do. \$5 (#30)

Mankind's Extinction Predictions: If any one of the experts who have written books predicting a soon-to-come catastrophe which will virtually wipe most of us out are right, we're in trouble. In this book I explain about the various disaster scenarios, like Nostradamus, who says the poles will soon shift (as they have several times in the past), wiping out 97% of mankind. Okay, so he's made a long string of past lucky guesses. The worst part of these predictions is the accuracy record of some of the experts. Will it be a pole shift, a new ice age, a massive solar flare, a comet or asteroid, a bioterrorisi attack? I'm getting ready, how about you? \$5 (#31)

Moondoggle: After reading René's book, NASA Mooned America, I read everything I could find on our Moon landings. I watched the videos, looked carefully at the photos, read the astronaut's biographies, and talked with some of my readers who worked for NASA. This book cites 25 good reasons I believe the whole Apollo program had to have been faked, \$5 (#32)

Classical Music Guide: A list of 100 CDs which will provide you with an outstanding collection of the finest classical music ever written. This is what you need to help you reduce stress. Classical music also raises youngster's IQs, helps plants grow faster, and will make you healthier. Just wait'll you hear some of Gotschalk's fabulous music! \$5 (#33)

The Radar Coverup: Is police radar dangerous? Ross Adey K6UI, a world authority, confirms the dangers of radio and magnetic fields. \$3 (#34)

Three Gatto Talks: A prize-winning teacher explains what's wrong with American schools and why our kids are not being educated. Why are Swedish youngsters, who start school at 7 years of age, leaving our kids in the dust? Our kids are intentionally being dumbed down by our school system - the least effective and most expensive in the world. \$5 (#35)

Aspartame: a.k.a. NutraSweet, the stuff in diet drinks, etc., can cause all kinds of serious health problems. Multiple sclerosis, for one. Read all about it, two pamphlets for a buck. (#38)

One Hour CW: Using this sneaky booklet even you can learn the Morse Code in one hour and pass that dumb 5wpm HF entry test, \$5 (#40)

Code Tape (T5): This tape will teach you the letters, numbers and punctuation you need to know if you are going on to learn the code at 13 or 20 wpm. \$5 (#41) Code Tape (T13): Once you know the code for the letters (#41) you can go immediately to copying 13 wpm (using my system). This should only take a couple of days. \$5 (#42)

Code Tape (T20): Or, you can start right out at 20 wpm and master it in a weekend. \$5 (#43)

Wayne Un-Dayton Talk: This is a 90minute tape of the talk I'd have given at the Dayton, if invited, \$5 (#50)

Wayne Tampa Talk: This is the talk I gave at the Tampa Global Sciences conference-where I cover amateur radio, cold fusion, health, books you should read, and so on. \$5 (#51)

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Wayne's Bell Saver Kit. The cable and instructions enabling you to inexpensively tape Art Bell W6OBB's nightly 5-hr radio talk show. \$5 (#83) NH Reform Party Keynote Speech. It wow'd 'em when I laid out plans for NH in 2020, with much better, yet lower cost schools, zero state taxes, far better health care, a more responsive state government, etc. \$1 (#85)

Stuff I didn't write, but you need: NASA Mooned America: René makes an air-tight case that NASA faked the Moon landings. This book will convince even you. \$25 (#90)

Last Skeptic of Science: This is René's book where he debunks a bunch of accepted scientific beliefs - such as the ice ages, the Earth being a magnet, the Moon causing the tides, and etc. \$25

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Make your list, count the words, including your call, address and phone number. Include a check or your credit card number and expiration. If you're placing a commercial ad, include an additional phone number, separate from your ad.

This is a monthly magazine, not a daily newspaper, so figure a couple months before the action starts; then be prepared. If you get too many calls, you priced it low. If you don't get many calls, too high.

So get busy. Blow the dust off, check everything out, make sure it still works right and maybe you can help make a ham newcomer or retired old timer happy with that rig you're not using now. Or you might get busy on your computer and put together a list of small gear/parts to send to those interested?

Send your ads and payment to: 73 Magazine, Barter 'n' Buy, 70 Hancock Rd., Peterborough NH 03458 and get set for the phone calls. The deadline for the August 2000 classified ad section is June 10, 2000.

President Clinton probably doesn't have a copy of *Tormet's Electronics Bench Reference* but you should. Check it out at [www.ohio.net/~rtormet/index.htm]—over 100 pages of circuits, tables, RF design information, sources, etc. BNB530

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ON THE GO

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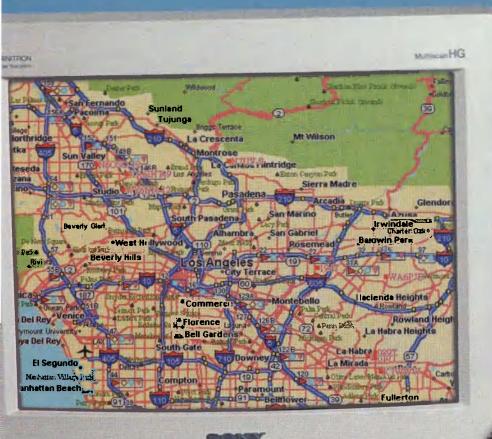
comfortable, works well in a real-world environment, and provides good audio.

The interesting thing about this headset is that it is available for a very reasonable price. It costs only \$44.95 assembled, or \$29.95 in a kit. A connector kit is available for about ten dollars, depending upon the radio to which it will be connected. The directions for the kit are easy to read and follow, and make for one of those quick and easy projects that is just plain satisfying.

There are a couple of accessories that may make your operating more pleasant. There are two types of push-to-talk switches. A hand-held push-button located in a tubular case fits comfortably in the hand. During listening periods it can be draped over the shoulder, or tucked through a belt loop to keep it handy. There is also a foot switch that I find very handy, since I often need to take copious notes during disaster support or other nets. This keeps my hands and desktop free for paper and pencil work.

I like this headset and believe it represents a lot of value for a very small price. Check out their Web site at [www.warrengregoire.com], or you can use their toll free number, 1 (800) 634-0094.

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THE TEAM

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QRX...

Dayton Winners Announced

It must be getting close. Dayton Hamvention 2000 has announced their Year 2000 award winners — another great group.

Amateur of the Year has been awarded to Martti Laine OH2BH. Martti is well known in the international amateur radio community as our #1 Ambassador of Good Will. He has been responsible for promoting the activation of new DXCC countries, traveling under difficult and often dangerous conditions to promote the hobby worldwide. Additionally, Martti is the only person to be inducted into the CQ DX Hall of Fame as well as the CQ Contest Hall of Fame.

The Technical Excellence award will go to Dr. H. Paul Shuch D6TX. Paul is being honored for his pioneering work in the 1970s in VHF, UHF, and microwave receiver design; and for his recent design of amateur radio astronomy equipment for the 21-cm hydrogen line region.

Special Achievement will be recognized by Prose Walker W4BW. Prose is being honored for his early involvement in developing the concept of obtaining new amateur frequency bands. Prose first went public with this concept in a speech to the Swiss Amateur Society in Geneva, Switzerland, in 1974. Additionally, Prose was the guiding force behind the development of ACAR

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Schools Get An F

With nearly two-thirds of the 8th graders in New York City failing the recent statewide English test, and more than threequarters failing the math test, these kids did so badly, according to the New York Post, that "they can barely add and subtract." Well, when I went to P.S. 199 and P.S. 99 in the New York City school system, back before teachers' unions and educational fads, the classes were large, the kids unruly, and the teachers just so-so, yet the results were far above what's being accomplished

This is particularly a kick in the head for disadvantaged children, who need the best help they can get to overcome their home environments.

There are complaints that it's the fault of the parents, who are not taking an interest and aren't spending time working with their kids. My parents never worked with me, nor did they show any interest in what was going on in my schools. They never even asked. Of course, I never did well in school, either. I just barely got by in most subjects, but I had plenty of time to spend down in the cellar building electronic and radio equipment. I had time to read a lot of books, to sing in the church choir, complete with rehearsals on Wednesday and Friday nights, go to a Boy Scout meeting once a week (Troop 34), sing with the school choral club and give concerts, play one of the lead parts in The Mikado, do endless darkroom work as a member of the camera club, and hardly ever miss seeing a new movie.

School, for me, was enormously boring, so I did just enough to get by, and spent my time on things that were more fun. In my K-12 years, I remember only one teacher who got me excited about the class, and that was Mr. Dockett, who taught art

in high school. He made it exciting and fun. I understood why my mother, who had had him as her teacher a generation before, had chosen to go on to Pratt Art Institute, where Maxfield Parrish was a classmate of hers.

There are a few outstanding schools in New York City, but the teachers, unions have been lighting hard to stop their unorthodox approaches to teaching.

Then there's the example of the Sudbury Valley School, which costs less than half as much per student to operate and whose students score through the roof on competitive exams.

Our public schools can be enormously improved if we (a) break the throttlehold the NEA has on them; (b) get the government the hell out of the school business; (c) draw on the successful examples of schools that are working.

The only area where our public school students excel is in feeling good about themselves.

The Icke Book

Dozens of readers have recommended my reading David Icke's ...and the truth shall set you free. Okay, now I've read it. It is not a fun book to read, but I had it with me on my visit to El Salvador, so I fought my way through 520 pages of detailed proof that a small group of men are running the world. Icke explains how, with the help of ETs, they got into the position to do this. Icke names names, and cites endless references.

Running the world? To the extent of being able to select our presidents, start and end the last few wars, and stuff like that. Why would this group want to start WWI and WWII? To lend money to governments on both sides to spend on war, and also to make the arms and munitions. War can be enormously profitable if you know what you're doing.



You make tanks, planes, submarines, battleships, and guns, most of which are then blown up and destroyed or outmoded. So you lend governments more money to buy more armaments from you, collecting interest on the loans and profits on the armament sales,

What Icke doesn't do, unfortunately, is offer any practical solutions on how we can get out of this mess. My approach to problems is to try and understand them and then come up with some practical ideas on what can be done to solve the problems. But what can we do about The Fed, a group of private banks which control our money supply and are funding our government, all with interest-paying loans. What can any of us do about the small groups of enormously wealthy people who are controlling just about everything? Indeed, anyone who makes much noise about it seems to have a heart attack or die in a car accident. I'm surprised they haven't punched lcke's ticket by

For years I've been reading conspiracy complaints about the Illuminati, the Bilderberg Group, the Trilateral Commission, the Council on Foreign Relations, the Club of Rome, a few top Masons, and so on — well. Icke puts it all together, along with their plans for a New World Order, a one-government system for the world, run by them.

The more I've researched the situation, the more I've found we're being scammed on almost everything we've been trained (brainwashed) to believe in. Our school system is a scam. Our socalled health care system another scam. Our food supply, and all of our media, aren't what they appear.

The book is \$22 and can be

had from Truth Seeker. Box 28550, San Dicgo CA 92198. Yeah, it's probably better to shrug and say the whole thing is a crock. Ignorance may not be bliss, but it's safer in some cases.

The New Math

Math was not one of my favorite subjects in high school. Bluntly, I hated most of it, but it was mandatory, so I had to grind my way through it.

Now, from the perspective of having been a high-tech manufacturer and the publisher of a whole bunch of high-tech magazines and books. I can look back on those years of misery and ask, hey, how come? Yes, a few things I learned in math have been helpful. But I can't think of any time in my life in the real world that the agony of dealing with trigonometry has been justified. Nor geometry, nor solid geometry, nor calculus in college.

At the time I was suffering endless agonies over the nights I had to spend memorizing calculus equations I asked the teacher what practical use there might be for all this. I got the strong impression that this concept hadn't ever crossed his mind before. Well, gee, if you ever want to figure out how large a sphere you can put into a cone you'll need calculus. You know, in the sixty years since then, it's never come up! Nor has any other practical application for all that crapola I had to memorize - and then quickly forget. Never in all these years of business have I had to solve simultaneous equations. Take that, Binomial Theorem.

So why was I put through the years of misery? I know you, as a fellow sufferer at the hands of

continued from page 1

(Advisory Committee of Amateur Radio), having established the committee and served as its first chair.

Thanks to Newsline, Bill Pasternak WA6ITF, editor.

Newsline YHOTY

The nominating period is now open for the year 2000 Newsline Young Ham of the Year Award. With corporate sponsorship from Yaesu USA and CQ Magazine, the Young Ham of the Year Award seeks to honor the amateur radio—related achievements of those hams age 18 or younger.

The Newsline Young Ham of the Year Award is your chance to bring proper tribute to the achievements of the younger members of our nationwide United States ham radio community. Prizes for this year's competition include an expense-paid week at Spacecamp in Huntsville, Alabama, courtesy of the folks at CQ Magazine.

Full rules and a nominating form are available for a self-addressed stamped envelope to the *Newsline* Young Ham of the Year Award, 28197 Robin Avenue, Santa Clarita CA 91350. Or, you can download the form and its instruction sheet at [www.arnewsline.org].

Thanks to Newsline, Bill Pasternak WA6ITF, editor.

East Timor Calls

According to Jeremy Boot G4NJH, there's a new country to work. It's called East Timor, and its establishment is a rather complex story.

The International Telecommunications Union has communicated to the United Nations the assignment of the prefix block 4WA-4WZ for use by radio stations within the areas administered by UNTAET, the United Nations' Temporary Administration of East Timor. This prefix assignment is for the use of UNTAET as long as it exists, and will be released to the ITU at the end of its existence.

All other private and amateur radio stations in East Timor will use the prefix 4W6. Individuals who expect to be there less than one year would use a 4W6/ home call, while those who will be there in excess of one year obtain 4W6 callsigns. Permanent residents of East Timor who were previously licensed may also obtain new permanent callsigns.

Sound complex? Then follow the advice of most old-time DX operators: Work the station first and worry later, or WFWL.

Thanks to Newsline, Bill Pasternak WA6ITF, editor.

New Fuel Cells

Fresh on the heels of word from Daimler Chrysler that it was developing a new practical fuel cell for automotive and other purposes, now comes news that Motorola researchers in Illinois and at Los Alamos are working on a new mini fuel cell battery for wireless devices.

Like the Chrysler fuel cell, this tiny version also uses methanol as a power source. It is said to have a life expectancy ten or more times that of conventional NiCd and NiMH cells in use today, and it wilt use transparent or translucent packaging so that users can check their fuel supply.

The research team says that it will be 2004 or 2005 before you see these mini fuel cells on store shelves — and when you do, be prepared for a little sticker shock. Word is that they will be a lot more expensive than the batteries they are designed to replace.

Thanks to Newsline. Bill Pasternak WA6ITF. editor

Fate Twist

In a rather bizarre twist of fate, the government is seeking advice on protecting its computers from illegal infiltration with expert advice from convicted computer hacker Kevin David Mitnick, ex-N6NHG. This, only a few weeks after the government released him from a federal prison.

This spring. Mitnick appeared before a Senate panel that's looking into the hacking problem. According to news reports, members of the Senate Governmental Affairs Committee asked the former ham to explain the ways in which hackers infiltrate sensitive computer systems. They also want him to suggest solutions In dealing with hackers to lawmakers.

Mitnick is reported to have offered a half-dozen suggestions to help combat the problem. These include requiring agencies to assess what data is most valuable and training employees to recognize attacks under way. The Senate Governmental Affairs Committee is considering a wide-ranging bill to require each government agency to create an anti-hacker program.

Thanks to Newsline, Bill Pasternak WA6ITF, editor.

Things To Say When Caught Napping At Your Desk ...

- 15. "They told me at the blood bank that this might happen."
- 14. "This is just a 15 minute power-nap like they raved about in the last management course that you sent me to."
- 13. "Whew! Guess I left the top off the liquid paper."
- 12. "I wasn't sleepingl I was meditating on the mission statement and envisioning a new paradigm!"
- 11. "This is one of the seven habits of highly effective people!"

- 10, "I was testing the keyboard for drool resistance"
- 9. "Actually, I was doing a 'Stress Level Elimination Exercise Plan' (SLEEP) that I learned at the last mandatory seminar you made me attend."
- 8. "I was doing a highly specific Yoga exercise to relieve work-related stress. Are you discriminatory towards people who practice Yoga?"
- 7. "Darn! Why did you interrupt me? I had almost figured out a solution to our biggest problem."
- 6. "The coffee machine is broke ..."
- 5. "Someone must have put decaff in the wrong pot."
- 4. "Boy, that cold medicine I took last night just won't wear off!"
- 3. "Ah, the unique and unpredictable circadian rhythms of the workaholic!"
- "I wasn't sleeping. I was trying to pick up my contact lens without using my hands."

And the #1 Best Thing To Say If You Get Caught Napping At Your Desk:

1. "... Amen."

Thanks to Radio Flyer, UBET (UT) ARC, September 1999.

The Old Junk Box

In days of old when hams were bold, With materials in short supply, They had to make do with their junk box gold, To grab signals out of the sky.

The home-brewer's junk box was a treasure chest.

It held everything salvaged and used, A jumbled mess in a junk box nest, With resistors, coils, and tubes.

In those days so lean when a ham's machine Needed this or that to run,

The old hobbyist rummaged in the box to glean The ones that would make it hum.

As the years rolled by the junk box grew nigh, New stock now easy to obtain,

From catalog stores with shelves stacked high. The parts are easily gained.

And so it goes for the hams of the past, And their junk box of traditional gore,

New hams won't remember the box that had class,

Now replaced by a Radio Shack store.

© 1998 by Bill Hendrey KC6JGS, in memory of Dan Wright K7GCJ, a ham's ham who loved to home-brew.

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From the Ham Shack

John Lawson W3ZC, Hatfield PA. I have been a ham for 46 years and I can assure you that I know which side of the soldering iron to pick up. I'm not a historian, but I have seen a lot of ups and downs in amateur radio. Unfortunately, lately there have been more downs than ups. With that said, here we go again. The dumbing down of the amateur radio license continues much to the delight of those who want more numbers at any cost. More licensees means more hardware and publication sales. Isn't that right, Wayne?

In the 1960s, the FCC at the behest of the ARRL, embarked on the incentive licensing program, a move that I considered imaginative and correct. It meant that in order to obtain additional privileges, you had to work and study to get or to upgrade an amateur radio license. It was an attempt to finally establish some order to the license structure and to provide a reward for working on an upward advancement. Of course, obtaining an amateur license was not made easier. I'm not sure if the sending test was eliminated at that time or at an earlier time. Nonetheless, the elimination was based on statistics that said if an applicant was capable of receiving the code, rarely if ever did that applicant fail the sending of the code. New licensees leveled off much to the consternation of manufacturers and publishers, who wanted higher numbers and sales. Well, the wailing and lamentations finally paid off for the squeaky wheel set with the dumbing-down of the VE test.

When the VE test program was started in 1984, I thought it was a move in the right direction to make testing more convenient to the hopefuls. I was certified by the ARRL and by W5YI. I participated in many, many VE sessions until the powers-that-be decided to change the nature of the written tests from "fill in the blanks" to multiple choice. This would most certainly boost the numbers. It was also a very discouraging shock, so much so that I told our VE captain that we shouldn't even worry about the testing — just present the applicants with whatever license they wanted when they entered the test site and paid their \$6+ bucks. I stopped participating not only in VE sessions, but also in amateur radio. I haven't been on the air in a year because I haven't as yet learned to say "10-4, Good Buddy."

Now, after April 15th, perhaps rather than have the applicants even show up at the testing site, we can arrange to mail them their license. We can aptly call this new approach the "License-of-Choice Program." It certainly would be appropriate to offer discounts from the beneficiaries. I can see a reduced fee for the likes of ARRL memberships, and 73 and CQ Magazine subscriptions.

I'm sure that Wayne will have the last word in his italicized response below. He will probably say that new licensees today have to start somewhere to begin to become more proficient. So why not give them the license first and turn them loose. Can you imagine the chaos if we did that with driver's or pilot's licenses? What's wrong with learning how to swim before jumping into the pool? Go ahead, Wayne, your turn.

Unfortunately, John, you're typical of the many old-timers who have bought the ARRL line — hook and sinker included — and who haven't read my editorials. Take the "incentive licensing" program. This was, as I've reported many times, cooked up by Hudson Division Director Mort Kahn W2KR, who had, through a coup, thrown out Bud Budlong WIBUD, the ARRL's General Manager, and had quietly taken over control of the League. When the membership dropped in 1962, Mort held a secret directors meeting on his yacht to come up with something controversial which would increase interest in the League. With the help of Tom McAnn K2CMM, one of his 3999 pals, they crafted the so-called incentive licensing plan. It was, in reality, merely a return to the pre-war Class A, Class B system of licensing.

But, to a hundred thousand or so hams it meant that in order to stay on voice on the major HF bands they would have to face the FCC inspectors and take new license exams. And newcomers were facing the old two-year wait on CW before upgrading. Well, this was controversial, and it would certainly cut down on the QRM on the old Class A bands for a while. However, instead of the League selling tens of thousands of new license manuals, they found that most hams were selling their equipment for whatever they could get for it rather than have to memorize all those Q&As again. This glut of used ham gear completely stopped the sale of new equipment, forcing almost 90% of the ham dealers out of business over the next two years, and close to 100% of the ham manufacturers. That was the end of the American ham industry. Our hobby, which had been growing at 11% per year steadily for the 17 years after WWII, suddenly was losing numbers. Around 90% of the ham clubs folded, as did most of the school radio clubs. This stopped youngsters from hearing about the hobby. Around 1960, the ARRL did a survey which showed that 80% of all new hams were teenagers, and that 80% of those went on to high-tech careers as a result. And, since it is youngsters who do most of the inventing and pioneering of new technologies, when teenage new hams dropped to around 12%, that was pretty much the end of amateur radio contributing to technology, and to our high-tech industries, most of which had to move to Japan, where they have more hams than we do, and there are radio clubs in every school. In the 35 years since "incentive licensing," our ranks have grown at around 1% per year. And yes, you bet there is strength in numbers. But I suspect, John and you admit you're inactive - that you would like to keep amateur radio the preserve of old white men until some lobby group comes along and wants to buy our frequencies for a song. — Wayne.

Mike Leahan N9POK. There is an even easier way to use a TV tuner to listen to UHF and above. Find an old mechanical television tuner (it should be right behind the plastic knob that you use to tune from channel 14 to old channel 83). Tear it off the television chassis. Make a piece of coaxial cable with a connector that fits the RF output jack of the tuner (probably looks like an old audio jack) and the antenna input of a low band VHF monitor (I used an old Patrolman 2B tunable monitor). Connect the tuner to the monitor. Solder a 9 V or 12 V power source to the side of the tuner (just solder the black wire to the chassis of the tuner), then solder a short piece of wire, say 8-9 cm, to the antenna lead of the tuner. Adjust the frequency of the monitor to somewhere around 47 MHz (the TV IF frequency, which is also the output of the old TV tuner) and start tuning around with the tuner up around 800 MHz, otherwise known as old TV channel 83 and below. Voilà! You have constructed a tunable frequency converter for almost nothing.

A fool and his money are soon partying.

Steven K. Roberts N4RVE Nomadic Research Labs 1313 S. Hagen Rd. Camano Island WA 98292-8478

Ah, the Technomadic Life!

This special to 73 on mobiling is ... well ... special.

I have to make a decision up front. This can be one of those articles that desperately struggles to cram a huge amount of technical information into a relatively tight space, which, even with the generous room allotted by 73, won't be enough. Or I can accept the futility of that approach and talk instead about what REALLY matters — the mad, obsessive technopassion that turns seemingly ordinary people into hams and hobbyists ... and what happens when you let it completely take over your life.

nd I do mean completely ... On the surface, what we have here Lis a pair of high-tech adventure platforms, the result of 17 years of nonstop focus, the contributions of hundreds of sponsors, and volunteer engineering wizardry from some of the most amazing minds in industry. The level of complexity in these machines is mind-numbing, but the motives behind them are exquisitely simple: freedom, adventure, discovery, and that twisted fascination with mobile wireless connectivity that I suspect everyone reading this magazine feels in some deep, nonverbal way.

I'm going to spare you the board-byboard analysis of an infinitely reconfigurable mobile network architecture, the amusing interplay of too many closely spaced antennas with a marginal counterpoise that varies with conditions, the layering of a browserflavored linux front end on top of a cluster of microcontrollers and sensors, and even the mad tail-chasing control theory that drives an adaptive self-optimizing solar thruster management system. We'll touch on all that, but the real subject is geek passion ... the stuff you FEEL in your core when 10 73 Amateur Radio Today • June 2000

you stand in front of a vendor booth at a hamfest and experience heart-pounding techno-lust. I know you know what I'm talking about, or you wouldn't be here ...

(Oh, don't worry. Before this is all over, I'll point you to enough technical information to scratch the itch, and even give you a way to pitch in if you're so inclined.)

The prehistory of a nomad

It began in Kentucky in the early '60s: I was WN4KSW, a skinny, burrheaded 13-year-old prisoner of school, isolated in the cultural drought of the '50s. I was theoretically a smart little bugger, according to test scores, yet I kept hearing that I had attitude problems and wasn't working up to my potential. With the exception of science fairs, my academic career was disappointing to authority figures.

I didn't care: I had a secret life!

School received the minimum attention required, which wasn't much. My real life was far too important to dilute with homework: Since the age of 8, I had been obsessed with electronics, my lab, and the vague notion that if I prowled the magical world of electronic surplus

with enough finesse, I might even be able to cobble together a computer with a few thousand 12AU7s and an air conditioner. I amused myself with microphones in the ductwork and a phone line routed through an old black-crackle 19" rack, listening to domestic goings-on via an 8-ohm primary looped around the lab and an amplified loopstick on my headphones. I fancied a girl up the street when I was way too young to know why, and gave her a walkie-talkie so we could lie under the covers and giggle to each other and I struck an uneasy balance of power with neighborhood rednecks-in-training by countering their harassment with a highvoltage "Tickle Stick" connected to parallel squirt guns loaded with saltwater.

Empowering stuff indeed, but most seductive of all was radio ... for it connected me to the Outside.

It's like a flashback now, recalling the chirpy CW of my 50C5 crystal oscillator and the magical noises emanating from the Star Roamer ... as well as the Heaths and Hammarlunds that followed. Other people, other tongues, strange sideband squawks, blokes on marine radiotelephone saying "I bloody miss you," political realities and cultural attitudes utterly unlike the Huntley-Brinkley Report that invariably accompanied dinner. I spent years gazing through this electronic window and building my tools; like the railroad tracks that passed near my house, radio became deeply symbolic of escape and movement. My physical adventures were confined to rural bike hikes; in my head, I could cruise the universe with a skyhook and a suitably powerful collection of instruments ablaze with Nixies, slide rule dials, dancing D'Arsonvals, and round green CRTs.

Years passed. Adventures happened; technology went deliciously berserk. I dabbled in careers, started a microcomputer consulting business called Cybertronics after firing up a homebrew 8008 system in 1974, wrote technical articles and a few books, and pulled all nighters of coffee-wired 8bit hacking around every seductive new gizmological marvel. But through it all, one image kept coming back to me: an assemblage of communication and computing equipment symbolic of freedom ... a toolset for escape. Thus it was only natural, when at last in 1983 the first tentative network infrastructure was in place, that I would trash

my suburban lifestyle and take off across America on a recumbent bicycle dubbed the Winnebiko ... carrying a solar-powered computer through which I could connect to CompuServe from pay phones at an astonishing 300

I had just invented technomadics.

Winnebiko and BEHEMOTH

Life became a merger of passion and technology, art and engineering. I was fortunate enough to become a public symbol of network-enabled freedom, and sponsors began donating the equipment and workspace to create new versions of the bike. Volunteers jumped on board, the media maintained an unrelenting thirst for stories, and I even got into the once-unthinkable public speaking business. Despite chronic lifelong bad work habits, I was learning to survive on the spinoffs of play.

From 1983 through 1991, I covered 17,000 miles on three versions of the bike, actually living on the road for about 3.5 of those years and spending the rest of the time in various labs building machines, holed up writing articles, or rumbling around the US under diesel power on speaking tours. A

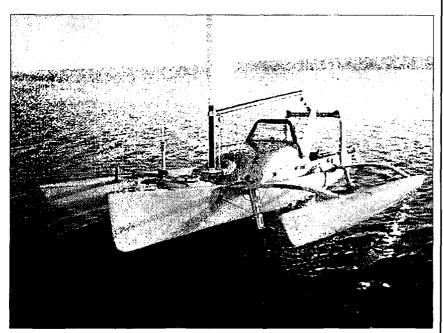


Photo A. The Microship, almost complete, missing only the fabric dodger, solar array, most of the antennas, and pressurized control console. The winch handle at the bow is for steering on land. Note, also, the drum at the base of the mast, which allows remote furling from the cockpit.



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Photo B. The carbon-fiber rudder blade is steered and retracted by Clippard doubleacting hydraulic cylinders.



Photo C. Hydraulic controls for landing gear steering, using a cam follower to implement the Ackerman function and a separate control arm to "pigeon toe" the front wheels for hill-holding — a sort of software brake.

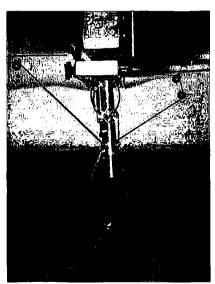


Photo D. Forward landing gear assembly before final anodizing. A hydraulic cylinder clamped to tensioned stainless cable rotates a teflon-lined collar, which couples steering inputs via the scissors assembly to the spindle bearings that carry the wheel. A column of elastomeric bumpers provides 8" of suspension travel with a 4G limit. The entire strut is retracted and extended by lines, driven by levers at the gunwales, which also add hydraulic control inputs to rotate the wheels into operating position.

long 73 column series in '88-'89 focused on the ham radio aspects of the adventure (many of those tales written on a binary handlebar keyboard while pedaling the coasts, others pounded into a laptop in the confines of my tent, consuming the day's stored solar energy).

BEHEMOTH, the final incarnation of the bike, was a 3-year Silicon Valley development project - an all-out effort to integrate every geek toy imaginable into a single system. The integration wasn't quite as complete as I had hoped and it was far too heavy, but the project did lay the groundwork for the Microship project to follow: a huge collection of diverse resources, each too dumb to be conventionally networked, all living in harmony under the umbrella of a processor and an array of crosspoint switches. The result of this approach is a coordinated toolset that feels like a single system, rendering a near infinite variety of bizarre applications trivial to implement.

Of course, BEHEMOTH was also a strange bicycle. At 580 pounds fully loaded (plus me), the name was apropos even without its acronymic coding: "Big Electronic Human-Energized Machine... Only Too Heavy." A 105-speed transmission helped me schlep it over mountains, pneumatically-deployed landing gear kept me upright in the granny gear, 72 watts of solar panels on the trailer ran everything except the wheels, a Qualcomm OmniTRACS terminal on the stern linked me to the Net, a heads-up display kept my right eye busy with a PC while my left gazed at the console Macintosh, ultrasonic sensors in the helmet converted head pitch and yaw into mouse movements, and binary chord keyboards in the handlebars let me yak contentedly to any of the target processors or chat live on packet while pedaling along.

The ham shack was a story in itself. Mounted behind a fold-down door in the bicycle trailer, it consisted of an Icom 725 for HF, the Yaesu 290/790 multimode pair for VHF/UHF and satellite operation, an AEA ATV rig, Bencher paddle, keyer, audio filters, antenna tuner, preamps, and so on. A folding dipole made from a pair of Outbackers on an extendible fiberglass

pole made an amazingly effective portable HF antenna, and Larsen whips took care of the rest.

All in all, BEHEMOTH was a fun bike ... but there was one slight problem. I had already been there! Returning to the road in 1991 was, despite some delicious mini-adventures, a letdown: Alter 16,000 miles on previous versions, there were few surprises lurking in the small towns and back roads of America. I started gazing at every waterway with a sense of longing ... weary of the noise and danger of asphalt.

The Microship project is born

The Microship project began with almost primal simplicity as I pedaled north along Lake Michigan in eastern Wisconsin ... if I could have wrapped a fiberglass hull around *BEHEMOTH* and pedaled 80 miles across the lake instead of huffing all the way up and around, I would have done so on the spot. But the bike was too heavy for such silly ideas, not to mention my onboard suite of nonseaworthy electronics that would, speaking optimistically, last about a day in even a freshwater nautical environment.

But shortly thereafter, while wandering the US in the Mothership on a speaking tour, a friend turned me on to sea kayaking and gave my unfocused water fantasies shape and direction. In early 1992. I announced the new project on the Net, initially naming the computerized kayak LEVIATHAN to echo the acronymic moniker of my bike. Over the next year, as I continued hauling BEHEMOTH between gigs and TV appearances (including an HF OSO from the bike on the Donahue show), my thoughts were far away ... layering communication and control systems onto a kayak ... or gee, maybe a catamaran built of two ... or gosh, possibly even a trimaran built of three! Hmmm

I had no clue at the time that I was about to undertake eight dedicated and expensive years of system design and redesign, fiberglass fabrication, hydraulics engineering, Perl coding, changes of fundamental direction, establishing a succession of labs up and down the West Coast, developing and maintaining over 150 sponsor relationships, constant questing for volunteers, and the most expensive (and educational) project of my life. It's a good thing I didn't know this: It would have been intimidating enough to squelch the whole project.

The substrate

I'll spare you the intermediate stages: suffice it to say that the machines called Microships, now in our Camano Island lab, did not spring fully formed from the compost of my imagination. Along the way, I went through extensive nautical learning curves, in the process championing and then discarding dozens of designs ... including one based on a 30-foot cruising-scale folding tri that kept me distracted for two years. But technomadness prevailed.

The whole objective here is to build a pair of human-scale amphibian boatlets since my XYL, Natasha KF6NWO, and I would kill each other if we tried to coexist in one! Each boat (lo and Europa) needs multiple independent modes of propulsion — pedal, solar, and sail - and must accommodate pressurized control consoles to protect the gizmology that keeps us simultaneously amused and connected. The center hulls are canoes - Keylar Wenonah Odysseys — with extensive | cruising on photon power.

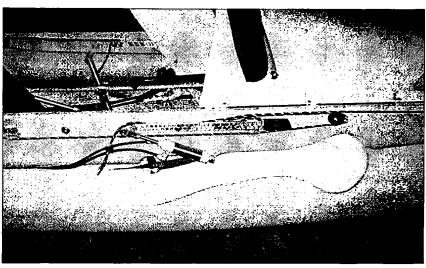


Photo E. Landing gear control levers, along with the SpinFin deployable pedal drive unit that uses a 13" model airplane prop to propel the 19' trimaran at roughly 4 knots under pizza power. The electric thruster, not shown, uses a 480-watt peak-power-tracked solar array to yield approximately 5.5 knots.

retrofitting to handle the stresses of a rotating 93 square foot sailrig and forward-angled daggerboard, with bulkheads added at the crossbeams, hatches at both ends, added arch structures, anchoring fixtures, hydraulically controlled retractable rudders, and endlessly complex deck details. A pedal drive unit allows human-powered operation at about 4 knots, and an electric thruster powered by a huge folding 480-watt foam-core solar array allows

One of the more challenging design problems was meeting the fundamental requirement for unassisted haulout and land transport ... without having some noisy truck and trailer following us around for years. Lightweight canoes and kayaks can be portaged; trailer sailors can be trailered; yachts can be used as residences. But what does a traveling couple do with a pair of 600-pound folding trimarans at the end of the day? Well, we can drop anchor and sleep aboard in the



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Photo F. The Microship perched on her landing gear under a full moon, looking decidedly stealthy.

coffinlike confines of the hulls, but it's a spartan existence. More often, we'll just pull a few levers, deploying our landing gear, and trundle out of the water like the strange amphibian creatures we are. The struts on my boat involved over a year of full-time development work, and include hydraulic controls, elastomeric shock absorbers that can handle 4G shock loads, Ackerman steering geometry, and tuck-away retractability from the cockpit like the landing gear of a fighter jet.

Excessive? Absurd? How many

away with you and imagined some mad machine, ultimate hamshack, or bizarre mobile contraption ... a creation that expresses your passion without such mundane constraints as cost or fabrication time? The beauty of turning a passion into a career is that suddenly, such mad notions become completely reasonable ... or at the very least a justifiable way to spend your life.

Under the hood

OK, so we have these retrofitted canoes that have morphed radically into amphibian folding solar trimarans with auxiliary burrito-and-wind propulsion. Now what?

Well, being geeks who thrive on ham radio, wireless data links, massive computing power, and amusing toys, the next step is obvious. A pressurized folding console (with a dedicated processor just keeping the nasties out and monitoring the internal environment) contains a tightly packed assemblage of goodies ... but immediately we run into a huge and potentially daunting design problem. How do you take a very wide range of standalone systems - ham equipment, speech and music synthesizers, cellular and satellite phones, nav and environmental sensors, dedicated controllers, marine radio, and so on — and present them as a single integrated environment that can fit on a single control console? In a times have you let your fantasies run | lab, it would be easy to just rackmount the whole mess ... but in a Microship, there's only about 9" of console height between pedaling legs and the pilot's line of sight across the bow!

The core of the machine has come to be known as Grand Central Station a trio of crosspoint networks controlled by a New Micros 68HC11 board running FORTH. The first section is audio ... 32 inputs and 32 outputs, with up to 8 simultaneous connections among any combination, invoked by a simple command. A similar system handles 16 video sources and 8 video sinks ... and a third unit allows any of 32 random RS-232 serial devices to yak back and forth with any other (complete with automatic polarity detection so I never again have to swap pins 2 and 3!). In a similar vein, a bank of solid state relays allows power to be selectively applied anywhere, and a passel of digital and analog inputs cover just about any sensor need, including a huge amount of internal status monitoring and a suite of environmental water- and air-quality channels.

It may sound like overkill in a canoe, but look at what this does for us! When anything can be connected to anything under software control, every widget reduces to a set of addresses. The Icom 706? It's a serial port, a pair of audio channels, a power-control bit, and a PTT bit. Globalstar satellite phone? A couple of serial ports and more audio. Packet TNC? More of the same. Compass, wind sensor, and other environmental black boxes? Just incoming serial streams. Dedicated systems such as solar peak power trackers and video turret control? Simple bidirectional ports. The processor that sits on top of all this - an I/O-rich Octagon PC-680 industrial embedded Pentium board running Debian GNU/Linux — has a bunch of code modules (written in Perl), that take care of issuing the various connect commands, databasing incoming time- and location-stamped sensor info, sending telemetry to our public server, creating display widgets on the console ... well, you get the idea. Everything on board, thanks to Grand Central Station, has become the moral

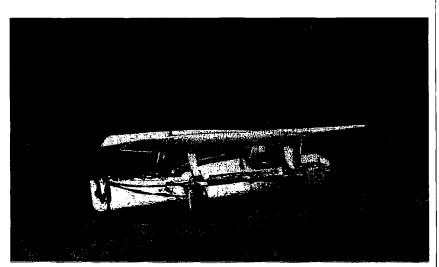


Photo G. In "land mode," deployable landing gear allow easy portaging, though hills can be challenging. We haven't figured out what to do about gravity yet.



Photo H. Steve Roberts N4RVE, hauling the folded trimaran down to Saratoga Passage on the west side of Camano Island for a test sail.

Ah, the Technomadic Life! continued from page 15

equivalent of code, and the front end looks just like a Web site.

On the water, Microship mobile ...

The net effect of all this is a sort of Star Trek gestalt: complete integration of all communication, control, and

sensor tools with access from any of the four browser environments (two boats and two backpack laptops, all linked via high-speed wireless network). Random. interconnects are trivial to implement, so it's no big deal, for example, to speak a verbal command like "Where is Natasha?" via dualband HT and have the Microship system respond over the air with a synthesized voice, giving me range and bearing based on the latest APRS

data from both of our packs. Or to have the security system respond to unauthorized midnight hatch opening by rotating the steerable camera platform to face the intruder, flooding him with IR, and routing video to the serial-controlled VCR while simultaneously paging me and calling the police. And streaming 50+ sensor channels to console Java strip chart emulators, live

instrument displays, and outgoing satellite/packet telemetry to our public breadcrumb-trail server is a piece o' cake

Of course, the real point here is taking all those geek delights and integrating them into an adventure ... and my XYL and I are leaving our island lab in the Spring of 2001 to begin a 15,000+ mile mobile field day: a circumnavigation of the eastern US beginning down the road at the mouth of the Columbia River (inside the bar!). From there, it's a 465-mile slog upriver to Lewiston, Idaho, where we'll load the boatlets into a truck and haul them over the Rockies to the headwaters of the Missouri River at Three Forks, Montana.

There begins the downhill run, though from what I've read of the upper Missouri that's a bit of an oversimplification. We'll traipse 2,546 miles across the northern plains and down between Nebraska and Iowa ... cutting east to join the Mississippi River just above St. Louis. A short float downriver brings us to the mouth of the Ohio ... then upriver slightly to the Tennessee, whereupon we turn south and continue along the Tenn-Tom Waterway and down the Tombigbee River to Mobile, Alabama (the more obvious parallel path down the lower Mississippi is relatively hostile to small boats). At the Gulf, we turn left on the

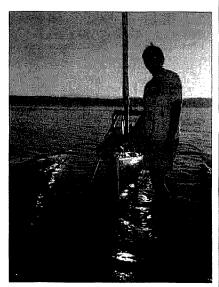


Photo 1. Arrhh! Fresh from a successful nonelectronic test sail, N4RVE is about to start hauling her out of the water.



Photo J. N4RVE, Steven Roberts, at the BEHEMOTH hamshack, somewhere in Wisconsin.

Intracoastal Waterway and meander all the way around Florida (through the Everglades and the Keys) and north along the Atlantic Coast. The ICW will carry us past Boston, with no shortage of interesting explorations en route.

At this point, unless forced by seasons or sanity to shortcut up the Hudson, we encounter open coast for a while as we traverse the exquisitely convoluted Maine shoreline - then into the Bay of Fundy, followed by a short portage across New Brunswick at Moncton (to skip the suicidal outside coast of Nova Scotia). After darting around the Gaspé Peninsula during a favorable weather window, we'll head up the St. Lawrence, turn left at Montreal to sail down Lake Champlain, pop over to the Erie Canal, travel back in time across New York, emerge into Lake Erie, cruise up Lake Huron and down Lake Michigan, cut through Chicago to the Illinois, float down Old Muddy, then finally struggle up the Ohio River to Louisville, my boyhood OTH, where we'll stop at my father's house and truck the tattered and filthy Microships back to our Camano Island lab to fix things and address the long list of essential changes that should have been obvious at the beginning. And then? Who knows?

ORZ

Here's where you come in. Humanscale technomadic adventure puts us out there far from the gentle isolation of the lab, where "surfing" implies a succession of HTTP protocol transfers instead of careening headlong toward the rocks on the back of a rogue ferry wake. We'll be on the edge constantly, living in wild and unpredictable ways, always welcoming the warm QSOs, shared QTHs, and technical participation of the amateur community.

If you'd like to keep an eye on us, read archived and current road stories, get detailed technical information about the Microships, watch live telemetry, peer over our shoulders via the labcam, help with fabrication, or get on the mailing list for monthly updates, please visit our Web site at [http://www.microship.com]!

In the space of an article, I can

barely begin to describe the details of this system ... but as I stated at the outset, that wasn't my intent. The thing I'd like most to leave with you is much

more important than that: It's a sense of passion ... the wide-eyed delight

Continued on page 58





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Electronics Bench for Dummies

And it doesn't take an Einstein to know how important a good bench — like this one — really is.

The first principle of engineering is that if you are going to build something, you must have something to put it on. So this is it: an article on what goes under the rig, the bench.

Benches for ham rigs are a problem. The stores have computer benches that could be used. They look really stylish and might look good in a living room. But when you look closer you see it is usually cheap particleboard with a veneer over it. As for comfort, they look like they were designed by a guy who specializes in medieval torture equipment. They are perfectly suitable for a guy who weighs under 90 pounds and doesn't intend to move a muscle. On the other hand, the benches offered for

shops are good for carpenters to assemble furniture on, but they are murder for a ham rig. Too high, too narrow, and never fit into the place you want.

Benches don't have to be elaborate — merely a good strong table that is the correct distance above the floor and at least six feet long will do. The six feet comes from the fact that most people sit in the center and do not want to reach any farther than three feet. If it is less than six feet, then you are not making use of the space you have around you.

For your ham rig. you want a place where you can sprawl around and put your feet up on the bench without knocking the whole thing over or having it cave in. A leg rest under it is also nice, so you can change the position of your feet a little from time to time and avoid stiff legs. It is also nice to have the rig back far enough so that you have room in front for the log and keys without cramping. If the commercial bench is of the right width, it never is the correct length — and if it is the correct length, it is the wrong width.

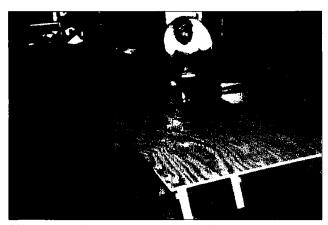


Photo A. Set the 4-ft. by 8-ft. piece of 3/4-inch plywood on sawhorses.

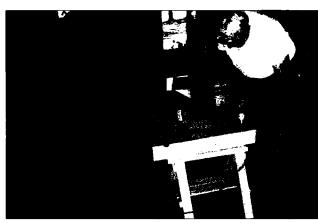


Photo B. You can use a nail tightly set in your drill chuck to make nail holes ...

Making your own has the additional advantage of allowing you to exactly fit it into the space you have and make it fit you besides. Also, when you only pay for the lumber and not the work, you get a lot more bench for your money. It is nice to have a bench designed for you first and not for the maximum profit of the manufacturer first.

A similar bench for a computer lets you have a place for a desktop computer so that you can change disks and CDs fast without fishing under the bench — which you have to do with a minitower. In addition, it would also allow the installation of new boards without getting yourself killed in positions that are taken only by a guy installing a new radio in an old car. You can put the printer on top of the desktop, so that putting the desktop on the desktop takes up no additional room. This arrangement also gives you lots more leg room.

I also want the computer monitor in a position such that I do not have to look up at it and far enough back (2 feet) so that I don't become nearsighted. The best is to have the monitor on the same table surface as the keyboard. If you have the monitor on top of the computer, eye strain develops.

I also wanted nothing that would require a cabinetmaker's tools, and I want to be able to put it together with a circular saw, drill, hammer, and wrench, the tools I have. I decided on a bench merely made of 2-by-4s and some ordinary 3/4-inch plywood, since I wanted it cheap, strong, and big. I decided to make a table 30-3/4 inches

above the floor, six feet long and 32 inches wide. This height makes it possible to store an office chair under the table with its arms clearing, as well as have enough room to put a standard two-drawer file cabinet (28 inches tall) under it. [Before deciding on the height of any desk or bench these days, it would probably be a good idea to research information on the optimum height(s) for avoiding metacarpal tunnel syndrome. — ed.] The width makes it possible to have your ham rig or computer CRT back 24 inches from the front edge of the table, which is a sightsaving feature.

So I went to the old discount lumber yard and bought:

- 1. One 3/4-in. plywood panel, 4 by 8 feet, good one side, indoor type.
- 2. Five 14-foot-long 2-by-4s (or any combination that makes up about 70 feet of it). (For you guys who aren't carpenters, a board that is 1-1/2 inches by 3-1/2 inches in cross-section is called a "two-by-four". That's because they are allowed a plus or minus 1/2-inch in lumber dimensions, and they always make it minus.) I checked them by eyeball to make sure they had no bad warps. At the prices I pay, you don't expect 2-by-4s to look like veneer ... and they sure didn't. Some still had some bark on them, but they were mostly pretty good.

I paid about \$50 for the whole lot. In addition, what is needed is:

- 3. Eight 5/16 cartridge bolts, 3-1/2 inches long. Also 6 nuts and 6 washers that fit on them.
 - 4. One box 8d finishing nails. They

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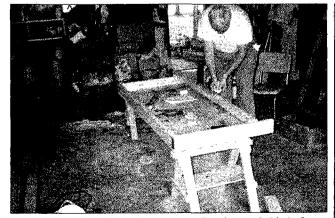
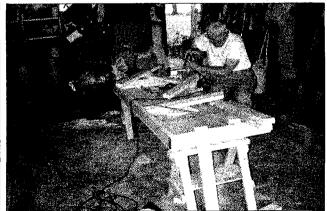


Photo C. Turn the plywood top over so that the good side is down. | Photo D. Cut four pieces of 2-by-4 30 inches long ...



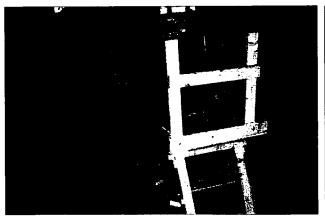


Photo E. Place the two "H" pieces in position as the lags, and clamp them in place.

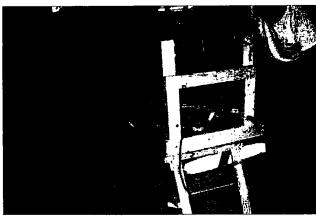


Photo F. Take a 2-by-4 and line it up with the gap between the H's crosspiece and the tabletop 2-by-4 ...

are 2-1/2 inches long. Since 2-by-4s are 1-1/2 inches thick, an 8d nail lets you nail two together without the nail going through.

- 5. One small bottle of white wood glue.
- 6. One circular sandpaper disk, medium, fits in drill (optional).
- 7. Two sheets coarse sandpaper, 2 sheets medium sandpaper.
- 8. A small amount of paint thinner. A pint is fine.
- 9. One quart of indoor latex paint, you pick the color. I picked green so that it would look something like a gambling table. It made me feel more at home.
- 10. About 4 hours of time, including a break, to complete unfinished. Finishing is longer, since you have to wait for the paint to dry.

The tools I used were:

- 1. A 7-1/4-in. circular saw with a combination blade.
 - 2. A hammer.
 - 3. An electric drill and 5/16-inch bit.
 - 4. A small block plane.
 - 5. A 5/16-inch wrench.
 - 6. Two 8-inch or larger clamps.
 - 7. A yardstick or roll ruler and pencil.
 - 8. A tri-square; 8-inch is OK.
 - 9. Two sawhorses.
 - 10. Two-inch paintbrush.

The idea was to put 2-by-4s around the edge of a piece of the 3/4-in. plywood, with the 3-1/2-inch side vertical. But across the front where you sit, the 2-by-4 has the 1-1/2-inch side vertical to give you more leg room. To make up for the difference in strength,

two 2-by-4s were run across the front. These two-by-fours were glued into place so that there are no nail holes through the plywood in front of the operator.

So, for those people who are not master carpenters, here's how to build it:

Photo A: Set the 4-by-8-foot piece of 3/4-inch plywood on sawhorses. good side up. Look for the best corner (usually, by the time you get plywood home at least one corner is chipped). Draw a rectangle from there for the size of the top you want to cut. This was, for me, 72 by 32 inches.

Also observe the safety precautions: wear some kind of eye protectors, make sure the wood being cut is solidly mounted, and, if necessary, use a clamp to the sawhorses. To keep metal clamps from marring the plywood, put a small piece of wood or heavy cardboard between the clamp and the plywood. Use a GFI electrical socket if outdoors or in a basement or garage.

Take up your circular saw, and make sure the sawhorses are not under the line you will be cutting. Remember, with a circular saw, WHEN THE LINE YOU DRAW IS IN ITS SIGHTS, THE PIECE TO THE LEFT WILL BE THE CORRECT DIMENSION. Cut. It should cut easily. If you have trouble cutting, you are using the wrong blade in your circular saw. Do not use a "plywood blade": That kind of blade is only for thin plywood veneer, not for 3/4-inch.

Photo B: Lay a 2-by-4 across the width of the plywood top and make a

mark on the 2-by-4, then use a trisquare to draw a line across the 2-by-4. It should be nearly 32 inches long. Always measure a single piece and draw a line. Never mark two lines at a time and cut twice, since the accuracy is not good enough to make the pieces fit well. Clamp the unmarked side of the 2-by-4 and then saw on the cut, using the line to guide your circular saw across. Use the sights on the saw, and keep the marked piece to the left. Sometimes, as you come to the end of the cut you may have to slightly rotate the 2-by-4 away from you to enlarge the opening of the cut to keep from jamming the blade. Usually this does not have to be done. Finish the cut even though you have passed the guideline you have drawn. By this time, the blade will be guided by the cut. There may be bad sections on some of the 2-by-4s. Just don't use them — except for firewood.

Then cut a piece of 2-by-4 69 inches long (the 72 inches of the width of the bench minus two 1-1/2-inch widths of the 2-by-4s).

With the plywood on the sawhorses. good side up, arrange the three pieces under the edges of the plywood top with the short side of the 2-by-4 against the plywood.

Place a nail in the drill chuck and push all the way in, close the chuck, but not tight. Pull the nail outward until the head just touches the teeth of the chuck, and push back slightly. Then tighten using the key in ALL THREE HOLES to keep it from slipping. Use

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this to drill the nail holes here and anywhere you ever need it in the following. The drilling of nail holes using a nail as a drill saves a lot of time, bent nails, and bruised fingers.

Drill a hole and drive an 8d nail through the plywood into the 2-by-4 about every 8 inches, but do not join the 2-by-4 s with nails yet. Use finishing nails 2-1/2 inches long.

Photo C: Turn over the plywood top so the good side is down on the sawhorses.

Drive three nails in each of the two corners to hold the 2-by-4s together. It is best to drill a hole for the nail beforehand whenever nailing.

Line up a 2-by-4 to fit the front edge between the two side pieces, draw a mark, use the trisquare to draw a line, and cut. Put a wiggly stripe of wood glue on the total length of one of the wide sides of this piece. If the piece has a bend, put it so that the center is high, not the ends. Press this side into place along the remaining edge of the top. Use wood clamps to hold in place until dry (usually overnight). If the wood clamps are metal, place pieces of scrap wood or cardboard between the clamp and the good side of the plywood to prevent marring from the clamp. If you do not have wood clamps, fill a bucket with water and use it as a weight to hold it in place. Drill and drive in three nails at the ends to hold the 2-by-4's together, but don't knock over the bucket of water.

Photo D: Cut four pieces of 2-by-4's 30 inches long (height of legs). Remember to measure, cut, measure, cut, etc. Again, never draw two or more lines then cut them.

Cut two pieces of 2-by-4 27 inches

Set the two 30-inch-long pieces down. Place a 27-inch piece to make an "H" with the bottom of the 27-inch piece 9 inches from the ends of the two 30inch pieces. Drill holes for the nails, putting one nail in each joint. Use a trisquare to make the pieces at right angles, then drill and drive in three more nails in each joint, making roughly a square pattern. When making this kind of joint, it is usually better that the nails be driven in at very slightly If you must choose between two evils, pick the one you've never tried before.

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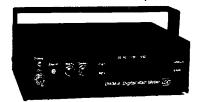
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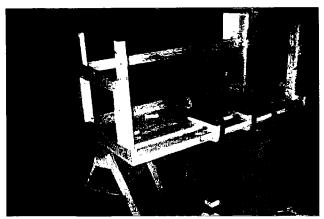
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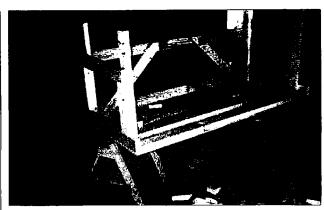


Photo H. Cut the end of a 2-by-4 off to form a 45 degree angle. Photo G. Cut two pieces equal to the overall length of the table ... | Place in position as a support, as shown, and mark and cut.

different angles to make them hold better. Repeat this, making a second "H."

Photo E: Place the two "H" pieces in position as the legs, and clamp in place.

Make sure the legs are firmly against the plywood top, and then drill a 5/16inch hole through the tabletop's 2-by-4s into the legs. Put a cartridge bolt into each joint, a washer, and a nut. Tighten so that the legs do not move firmly, but not hard. The final tightening will be done later.

Photo F: Take a 2-by-4 and line it up with the gap between the "H" crosspiece and the tabletop 2-by-4. Mark and draw a line. Tap it into position as shown. Drill three nail holes in each piece and drive in three nails spaced along its length, holding the piece with your other hand. Repeat for the other legs.

Photo G: Cut two pieces equal to the overall length of the table, about 72 inches long. Place one as shown across the legs: the other is a foot rest and will be put in later. Drill and nail in position as in photo.

Cut a piece of 2-by-4 equal in length to the piece previously glued along the front edge. Place it against the plywood next to the front 2-by-4 legs. Glue in place and clamp by putting small pieces of 2-by-4 across both this and the edge piece. Drill and drive in three nails in each end. Let glue dry. These 2-by-4s can support a standard 15"W by 12"D drawer [obtainable from Kitchen & Home. #615647, tel. 1 (800) 414-55441.

Photo H: Cut the end of a 2-by-4 off to form a 45 degree angle. Place in position as a support, as shown, and mark and cut. Place the piece as shown. Clamp them in place and drill two 5/ 16-inch holes in each as shown. Place a cartridge bolt in each hole and tighten firmly, but not all the way. Repeat for the second support.

Photo I: Flip the table off the saw-

horse and onto its legs. Make sure the table is on a flat surface, and tighten all the bolts. If the table wobbles, loosen the bolts and place a scrap of 2-by-4 under one of the diagonal legs that does not leave the floor and press down suddenly over the legs on the opposite diagonal. This may have to be done several times. When any wobble is gone, tighten all the bolts.

Put the remaining 72-inch 2-by-4 as a footrest, as shown, on the horizontal crosspieces, drill, and nail in place.

Cut off the front lower corners of the 2-by-4s at the front of the table as shown in the photo. This prevents hitting your knees on the protruding corners. Use a sanding disk in your drill to round off the edges.

At this point the construction is ended and the finishing starts.

Take a piece of coarse sandpaper and run it over all the 2-by-4s to get rid of the splinters and rough stuff. You should be able to run your hand over

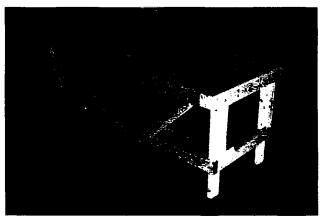


Photo I. Flip the table off the sawhorse and onto its legs.



Photo J. Finished bench.

the wood and it should feel smooth. This should not take more than 10 or 15 minutes.

Slightly round the edges of the tabletop to about a 1/4 in. radius, using a block plane. Set the plane to a small gap and run it around the edge, making a 45 degree flattening. Then go around to smooth the ridges at about 22-1/2 degrees, then at 67-1/2 degrees, and then run over it with hand-held coarse sandpaper. This only requires a few minutes, but you will be glad this edge is rounded when you use your rig or computer. Be sure it's well sanded, so your arms are not against a sharp edge when sitting at the table.

Cut two pieces of 2-by-4 to 5 inches long. Drill and nail them to the back edge of the table, at the sides, to hold the table away from the wall to make a space for cables and line cords. These are shown in **Photo I**.

Sand the desktop by wrapping a sheet of coarse sandpaper around a piece of scrap 2-by-4 that is longer than the sandpaper. Run over the top with a circular motion. This should only take about 5 minutes.

Take the other piece of coarse sandpaper and use it, by hand, to smooth off the 2-by-4s and the edge of the top. All wood surfaces should feel smooth to your hand. Fill in any holes with wood putty.

Use the paintbrush and dust off all sawdust off of the table and the legs. Soak a rag in paint thinner and run it over all the wood, but use rubber gloves — or wrap tin foil around the rag to keep it from contacting your skin. This removes all sawdust clinging to the wood. Do not skip this. Do not use water or let water contact the surface of the plywood before it is painted, since it will cause it to become rough.

Put the table back on the sawhorses, tabletop down. Paint it. (After each painting, hose the brush, and use a little detergent until the water runs clear, and you will have a usable brush after you finish.) When dry, go over the bench with medium sandpaper to make it smooth to the touch. Be careful you do not miss any rough spots. This should only take a few minutes.

Add the drawer if you want. Give it a second coat, but only paint the front of the drawer, not the rails.

Flip the table onto its legs. Wipe off the top with paint thinner as described and paint it. Go over again with medium sandpaper to make it smooth to the touch. After it has dried, give it a second coat. A third coat can be given to the top if you have any paint left.

Let the paint dry a day or more. Latex paint requires about a week to cure. During this time, the table should not be wiped with wet cloths. Some heavy objects, such as the computer monitor may stick a little to the top for the first two weeks. Place wax paper under the monitor during the curing time if this is a problem.

To complete the installation, you need an office desk chair. Get one at an office furniture store. Make sure it can be adjusted in height so that it can be set to just the right position. The table is built so that it is easy to trim a little off of the legs with a circular saw should the desk be too high. Save the scrap wood for a shelf.

Well, that's it. The table serves well, and I am hardly aware that it is there as I work, since there are no irritations coming from the table design. It may not look right in your living room, but people who see it are surprised that it is made from rough-in lumber and say it wouldn't look bad in a living room. Latex paint and a little sanding can cover up an awful lot of blemishes.

If you like it, you can build another for your computer or electronics workbench. Mine is shown in Photo J. I did not actually write about the bench shown with the ham rig on it, because that was my first one and had a number of mistakes that were corrected in the described design. I now have three of these benches in use.

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Tuner King Strikes Again

Part 1: Make a basic VHF/UHF signal source from your TV/VCR tuner.

Since my first TV/VCR Tuner Applications articles were published in 73 Amateur Radio Today (April, May, and June 1997), there has been a lot of interest expressed in using TV/VCR tuners as a signal source. Because TV/VCR tuners vary so much in design, examination and experimentation was deemed necessary to work out the minimum details required to create a signal generator from the more commonly available tuners. Three major concerns were expressed, involving frequency coverage, which tuners work best, and the available signal amplitude available.

Perhaps the easiest question to answer is which tuners work best. I've only been partially successful, at this point, in using the later model tuners that are digitally controlled. A digital tuner requires that a computer "word" generated by a microprocessor or data transmitter be clocked serially into the internal register and frequency synthesizer. An enable signal then sets the band for the tuner and the frequency for the phase-locked loop (PLL) circuit.

TYPICAL CONNECTOR MARKING UHF c OSC OUT VHF LOW, HIGH, SUPER BAND ₹ ≨ 47 MHz FINE +12 ∨ COARSE + 30 V TUNE 10 TURN 10K

Fig. 1. Typical TV/VCR tuner connections with voltage applied to all functions. Fine tuning may be done by controlling the 30 V source (shown) or by controlling a 1-2 volt source applied to the AFC/AFT terminal.

So far, relative to digital tuners, I've managed to circumvent the PLL on one tuner and operated it in an analog mode. I can't really call that a success, but I did learn a lot from the experience. I'm currently experimenting with a serial data transmitter that is capable of generating the desired computer word for the tuner.

Digital tuners appear to be an interesting challenge for those hams who are computer- and digitally inclined. The advantage, of course, is that a phase-locked oscillator increases the oscillator's stability — particularly when used as a signal generator. With the synthesizer controlling the frequency, every incremental or step frequency within the tuning band should be available.

All of the older-style analog TV/VCR tuners lend themselves very well for use as a signal generator, with some types working better than others. There are four basic types that I will discuss individually, with the modifications required for each.

Frequency range

Because TV and VCR tuners are designed to cover TV channels from 2

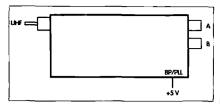


Fig. 2. A tuner having direct access to both local oscillators. Terminal "A" is usually connected to the UHF oscillator and terminal "B" is connected to the VHF oscillator. The output port is enabled when +5 volts is applied to the BP/PLL terminal.

to 69 (83 for older tuners), the frequency range is nearly the same for each. However, some tuners are capable of tuning a wider range than others, depending upon age and being "cable ready." Those tuners that are "cable ready" have the greatest frequency range when channel 83 has been included. Therefore, it is desirable to collect and test several tuners to find those having a preferred frequency range.

The typical tuner uses high side injection that places the internal oscillator approximately 47 MHz above the received signal. Table 1 shows the typical oscillator tuning frequency ranges vs. tuning voltage. Four typical tuners are shown with their respective oscillator frequency charts. The frequency range covers generally 90-900 MHz, with a few holes between tuner bands.

Tuner connections

Connections made to analog TV/ VCR tuners are nearly the same regardless of tuner design. But due to the manufacturing differences, terminal identification must be worked out for

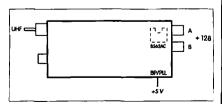


Fig. 3. The combined output from the local oscillator is divided by 128 before being made available at the connector. If the oscillator outputs are separated, "A" is usually the UHF output and "B" is the VHF output.

each tuner. I recommend that any terminal labeling indicated on the printed circuit board be transferred to the tuner's case. Fig. 1 shows the typical terminal connection scheme used for operating the tuner as a receiver's front end. Three frequency bands are shown and used by most tuners, with the "BS" and "BH" bands combined and enabled as "BH". Some tuners have four bands, with the "BH" and "BS" bands separated.

When used as a signal generator, I've found that 12 volts needs to be applied only to the respective band control terminal to enable the appropriate oscillator. A tuning voltage of 0-30 volts must be made available to the tuning voltage terminal for frequency control. When used as a basic tuner or when the tuner is used as a signal generator, the AFC terminal must be grounded. However, if used for fine tuning, a low value potentiometer-controlled voltage

(typically 2 volts maximum) may be applied to the AFC terminal. Because of the wide frequency range of each band, tuning is very fast and creates a need for a fine tuning control. Voltage sources for the tuner should be regulated to reduce drifting problems.

Of course, the antenna connections are not used unless the tuner will double as a tuner and a signal generator. And if that's the case, then respective voltages must be applied to the AGC and mixer terminals when used as a receiver front end. A 47 MHz receiver would be connected to the IF terminal when the tuner is used in the receiver mode.

Basic tuner types

Even though all TV/VCR tuners

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have a built-in local oscillator, the problem is, how do you gain access to it? Although there may be better and alternate methods, I'll discuss the methods that have worked for me.

There are four basic types of tuners that are available to hams (although they do not necessarily cover all of the variants). Each of the four will be discussed separately, three here and the

Table 1. Oscillator frequency vs. tuning voltage for four typical TV/VCR tuners.

fourth (mechanically variable) next time

I. Fig. 2 shows the typical shape of a tuner that provides direct access to the oscillators. One of the phono connectors, usually the upper one, is a direct output port from the UHF oscillator, and the lower phono connector may be a direct output from the VHF oscillator. When one or two phono connectors are used on the tuner, it is necessary to examine the output from each to determine its purpose.

In TV/VCR use, the direct output was connected to a phase-locked loop (PLL) circuit that divided the signal frequency of the oscillator and applied it to a frequency comparator. At the comparator, a reference signal was compared to the divided oscillator signal and that produced an error voltage. The error voltage was fed back into the tuner through the AFC/AFT terminal, where it would steer the oscillator to hold it onto a specific frequency TV channel.

For our purpose in using the local oscillator as a signal source, the output from the phono connector is used directly. If a "PLL" or "BP" terminal exists, then +5 V must be applied to that terminal to enable the output port circuit.

RG-174 is a suitable coax for transferring the signal from the phono connector to the outside front panel level control and panel connector. A potentiometer may be used as an output level control.

II. Another basic tuner type has an external appearance similar to the one above, and is shown in **Fig. 3**. This type of a tuner may also have a single "PLL" output phono connector instead of two as shown. The outputs of both oscillators are combined and ported to one phono connector. Steering voltage from the PLL circuit is fed back to the oscillator through the AFC/AFT terminal.

The difference between the two tuners (Figs. 2 and 3) lies internally, where a divide-by-128 IC is used to process the oscillator signal before it exits the tuner. Fig. 4 shows a typical internal mixing port for combining the VHF and UHF oscillator signals into a single output that is divided. The

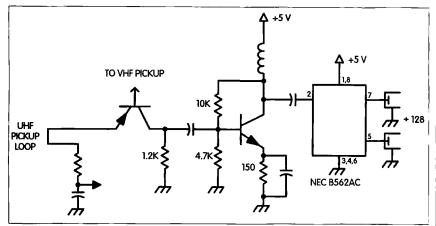


Fig. 4. Combined VHF and UHF oscillator output port with the divider circuit. (The circuit has been simplified for clarity.)

typical divider (128:1) IC used is an NEC B562AC, although other IC types have been used. Some provide a different divide ratio for VHF and **UHF** outputs.

Some tuners will divide the UHF output at the upper connector by 128.

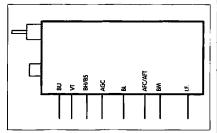


Fig. 5. The most common tuner configuration. There is no direct access to the internal oscillators.

The lower connector may be a direct output from one or both oscillators.

To obtain a direct oscillator output when one is not available at either connector, two techniques have been tried with success. The first technique was

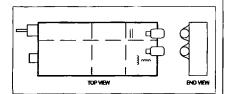


Fig. 6(a). Soldering two phono connectors to the top edge of the tuner's case. The end view shows jumper wires soldered over the connector's mounting to increase the mechanical support.

to remove the B562AC and place a jumper between pins 2 and 7. A second technique that requires less modification is to remove the wire from the phono connector. Then, an insulated wire is connected from the connector to pin 2 of the B562AC. Plus-5 volts must still be applied to the "BP/PLL" terminal to enable the mixer port. The signal out of the tuner is transferred as described for the tuner as in #1 above.

III. Fig. 5 shows the most common type of TV/VCR tuner. In the absence of an internal port connection to each of the local oscillators, external pickup loops must be placed into the oscillator circuits for direct access. It will be necessary to remove the metal shield cover over the tuner to expose the oscillator's resonators, of which there are two. The oscillator pickup loop may be mechanically stabilized by soldering a phono connector to the top edge of the tuner's case as shown in Fig. 6(a). Fig. 6(b) shows the general shape of the pickup loops that I've used successfully for optimum coupling. With the loops in place, each provides an individual signal output from an oscillator.

If some signal leakage can be tolerated in the final application, a switch may be used to toggle between the two output connectors. Short lengths of RC-174 coax are run between the pickup loop connectors to the switch, and then on to the output level potentiometer.

Placing the loop into the correct position requires a little experimentation. The objective is to couple tightly in

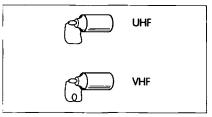


Fig. 6(b). Typical pickup loop configurations for the VHF and UHF oscillators.

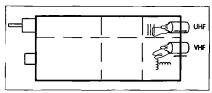


Fig. 7. Typical pickup loop placement in both the UHF and VHF oscillator circuits.

order to achieve maximum output from each oscillator.

Fig. 7 shows the placement positions that have worked for me. When in use as a signal generator there is no signal buffer in place (unless an amplifier is used) to prevent external loading changes from affecting the oscillator's frequency.

Part 2 of using a TV/VCR tuner as a signal source will continue with a discussion of basic tuners (including type IV), adjustments, calibration, and output amplitude. While waiting for Part 2, start collecting tuners and prepare to build your project!



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Well, Not Exactly

Some of the finer points about using your o'scope.

As we enter a new century, we hear the question asked, "What was the greatest invention of the last one?" Many answers are given, but no one mentions the cathode ray tube. This is very understandable, as it is taken for granted that the tube has always been here. Besides, there are not very many of us around anymore who remember what it was like to be an experimenter in the 1930s, before its existence.

lucky if they owned a 1.000 ohms/volt multimeter. Troubleshooting circuits was a real challenge, as measurements were restricted to DC and low frequency AC voltages. When it came to troubleshooting radio frequency circuits, the meter was of little use. This consisted of either applying what was then known about theory, component substitution, or plain guess work. It was a flying-blind experience.

At that time, an inventor named

Philo Farnesworth was working on an electronic display for television to replace the mechanical scanning disk that was then state-of-the-art. Nobody could have foreseen the impact that his brainchild, the cathode ray tube, would have on so many things throughout the remainder of the century. Besides being a display device for many things, such as used in television, radar, computers, and many other applications, in the form of the oscilloscope it is a most powerful diagnostic and developmental tool that makes it possible for us to peer into the invisible world of

electronic circuitry. Even though he deserved credit, history has been rather unkind to Mr. Farnesworth, as it gives him little recognition. As is so often the case, others with large financial resources took his idea to develop it faster than he could have, so his name is not exactly as widely known as Thomas Edison's.

The oscilloscope's development has came a long way since we amateurs first used a motor-driven mirror and gas-filled tube to observe the trapezoidal modulation pattern produced by our AM transmitters. Modern oscilloscopes have the capability to display complex wave shapes all the way up into the gigahertz range. When we are working on electronic circuitry and ask ourselves what is happening or why doesn't this work, it can give us answers in a hurry. If you are an experimenter, it is one of those things you just have to own. Should you own or contemplate buying one, there are a few things you may or may not like to know about them.

We all like to own the very best, but usually are forced to be practical where money is concerned. We settle for something at the right price that will just meet our needs.

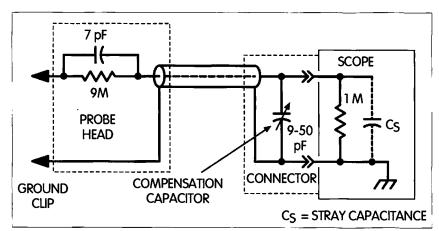


Fig. 1. 10:1-type probe.

Striking a compromise between the specifications of the instrument we would like to buy and what our pocket-book will tolerate can be an agonizing decision. The price of oscilloscopes seems to rise directly proportional to their vertical amplifier bandpass width. Most of us feel that one good up to 40 megahertz is adequate to meet our needs, and assume that signals in this range will be accurately displayed. For the instrument itself, this is very true. What the vertical input sees, is what it displays.

Being a pessimist (not liking unpleasant surprises), I am often heard saying, "If you do not expect anything, you are not disappointed." Working with oscilloscopes over the years has had something to do with it. When the pattern on the screen is not what it should be, it is one of those unpleasant surprises. Why does this happen, other than when a mistake was made?

The method used to transport the signal from the unit under test (UUT) to the input has much to do with what is displayed. If the question where posed, "Is the signal the scope input sees identical to that being fed into the test probe?", wouldn't you guess that almost everyone (not knowing much about test probes) would assume that the answer is "yes"? To the contrary, it could be, "Well, not exactly."

Most people who use oscilloscopes believe that the test probes they use are perfect in every way, and seldom consider them as a possible source of trouble. Having had a career in the electronics industry, I was amazed to learn just how few engineers and technicians knew the reason why they used the particular type of scope probe they did. Probes play an important role in what an oscilloscope displays, and their characteristics should be of interest to those who use them. Let's take a look at a few things about scope probes.

Reactances, be they inductive, capacitive, or resistive, in the signal path from the source to the scope input can spell trouble, and, like death and taxes, they are things we cannot avoid. We do our best to contend with them. Every shielded cable exhibits capacitance.

The 1:1 probe is the most basic. It consists of a length of shielded cable with a test pick and ground clip on one end and a connector on the other end for the scope input. Usually, the lowest capacity cable available exhibits about 10 or more picofarads of capacity per foot. The capacity of a 3-foot probe cable, plus the scope input capacity, can add up to around 40 picofarads. A scope probe with this much capacitive loading will upset many circuits operating above the audio range. Just how badly this will degrade a signal is largely determined by its source impedance and frequency. Because of this, the use of a 1:1 probe is generally restricted to relatively low frequency

The most commonly used probe is the 10:1 type. In using it, you need your head screwed on right to avoid making mistakes because the input attenuator settings are now multiplied by a factor of 10. Its advantage is that it presents very light loading to the circuit it is connected to. Typically, this probe presents less than 10 picofarads of capacitance shunting 10 megohms of resistive loading. It functions as a simple 10:1 resistive and capacitive voltage divider (shown in Fig. 1). The small input capacitor (shunting the 9 meg input resistor) and that of the combined compensating capacitor, cable capacitance, and scope input capacitance form a 10:1 AC voltage divider, as do the resistive components for DC.

A 1 volt peak-to-peak, 1 kilohertz square wave test signal source is usually provided on the front panel of the instrument for the purpose of adjusting the probe compensating capacitor. Theory tells us that a square wave contains the fundamental frequency plus an infinite number of its harmonics. Therefore, if we use this signal to adjust the compensating capacitor to display the square wave without any overshoot or undershoot, can it be assumed that the frequency response is uniform throughout the probe's useful spectrum?

Well, not exactly. In practice, the presence of harmonics up to the tenth one will produce a reasonable reproduction

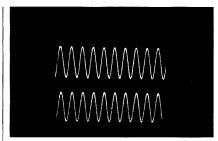


Photo A. A 5 kHz sine wave. Article photography by Peg Syverson.

of the square wave, and up to the twentieth harmonic, slightly better. The amplitude of those above the twentieth harmonic are considerably lower, and their presence or absence is relatively undetectable. The 1 kilohertz square wave test signal can really only give us assurance up to about 20 kilohertz, which is an exceedingly small percentage of the total bandpass (about .05% of a 40 MHz scope's band pass). Photos A and B show the amplitude and phase changes one might expect using a low-priced 10:1 test probe to exhibit. Photo A is that of a 5 kHz sine wave. The upper trace is the input to the probe, and the lower trace is the output. Amplitudewise, they are the same, but the lower trace is shifted by approximately 10 degrees. Photo B is that of the same probe at 30 MHz. The output is now down about 15% and the phase shift is nearing 180 degrees. This may or may not be of any consequence. It all depends upon what we are trying to measure. Higher-priced scope probes may contain some form of frequency compensation to level off the response curve.

We know that an unloaded conductor or unterminated transmission line (which the 1:1 and 10:1 scope cables are), when shocked by a steep rise or fall time signal, will produce a train of

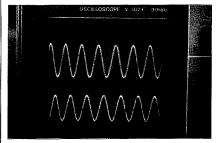


Photo B. The same probe at 30 MHz.

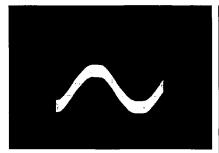


Photo C. Sine wave of a big, bad 60 Hz signal.

damped oscillations at its resonant frequency (ringing). With the scope input capacitance, that of the compensating capacitor and that of the circuit being tested can resonate at some frequency to set the stage for ringing to appear on the trace. When unexplained ringing appears on a trace, it is not necessarily coming from the circuit under test.

Using a terminated coaxial line to transport the signal to the scope input gets around the frequency response and ringing problems of the aforementioned probes nicely. The only problem is that the source must be able to deliver power into a very low resistance load (50 ohms typically). This pretty much limits its use to low impedance power sources. However, it is used in the VHF range where the generally used probes tend to be less useful frequency-wise and the input and output impedances are generally 50 ohms.

There is one type of probe that combines the high input impedance characteristics of the 10:1 type probe with that of terminated line. It is the active probe. Basically, it is a wideband unity

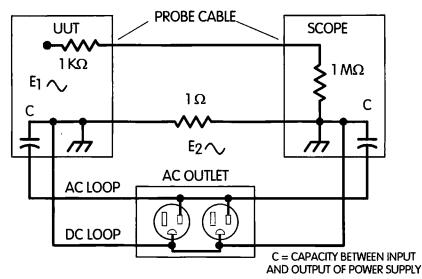


Fig. 2(b). Problems arise when unwanted currents flow through the probe cable shield impedance. This illustrates one way that this can happen.

gain amplifier located in the head of the probe. It has very high input and very low output impedance intended to drive its terminated coaxial cable. The amplifier has a very high current gain (well over 1,000). At 1 volt, a few nanoamperes of input current will cause 20 milliamperes of current to flow in a 50 ohm cable termination. While looking ideal, it isn't exactly. Operating potentials for the amplifier must be supplied to the probe head. The peakto-peak input signal level cannot exceed the supply voltage values unless a suitable frequency-compensated attenuator is provided ahead of the amplifier input. Thus, to increase the useful input voltage range could mean another control to set, and tend to

make the probe head bulkier and not suitable for getting into tight places. Even though it has a wide bandwidth, these may be the reasons for it not being widely used.

Every so often, we have the need to view a signal down in the millivolt range. Frequently, the scope display we want to view is riding on top of a big old (usually 60 hertz) signal that the scope prefers to trigger on (as shown in **Photo C**), much to our dismay. It is wanted about as much as the ham with the kilowatt rig that covers up a weak DX signal you are trying to copy. Where does it come from?

For convenience, probe cables need to be flexible. Also, the resistance of the cable is of little consequence, as the normal signal currents normally produce far less than 1 microvolt of voltage drop, which is insignificant. Fig. 2(a) is a simplified schematic of the resistance path encountered by the source voltage (E1) of a unit under test through a 1:1 test probe to the 1 megohm input resistance of the scope. The I ohm resistor is the value of what the cable shield impedance might be. The probe cable impedance plus the source impedance (1 k ohm) being very small in comparison to the scope 1 megohm input impedance, practically all of voltage E1 appears across it.

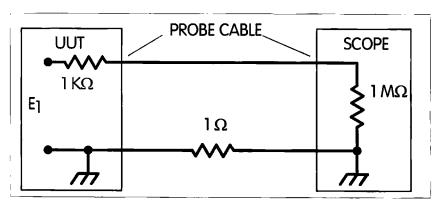


Fig. 2(a). A simplified schematic of the resistance path encountered by the source voltage (E1) of a unit under test through a 1:1 test probe to the 1 megohm input resistance of the scope.



Straight Talk about ClearSpeech

This Am-Com speaker gets a "B" from the reviewer — but also gets kept.

Looking for a way to hear more audio and less noise? The ClearSpeech speaker may do the job, in spite of a few quirks!

For several months, I contemplated the advertisements for the Am-Com ClearSpeech speaker. After seeing some favorable comments posted on a ham radio special interest group, I decided to buy it and give it a try.

The Application — mobile HF

The ClearSpeech unit promises to filter background noise, static, and other interference. These qualities looked appealing for my mobile HF operations. I have an Alinco DX-70TH permanently mounted in my car, a Mercury Grand Marquis. When parked, with the engine off, the installation does very well. With the engine running, it's a different story. In spite of numerous grounding straps, heavy power leads connected to the battery, and a fuel pump noise filter installed by my dealer, the Mercury generates substantial noise that interferes with the pleasures of HF mobile operation. Could the ClearSpeech improve my situation?

When I called Am-Com, the speaker was on back order, but well inside the promised delivery period, my unit arrived. The speaker comes nicely packaged, with a well-written instruction

manual. It appears well-made and comes with a mounting bracket for mobile or base installation.

Due to the complex mobile installation in my vehicle, this was not going to be a simple "plug and play" situation. The transceiver is in the trunk and the control head under the dash, and the speaker is mounted on the "B" pillar near the roof. (Note: I do not recommend this mounting location for

The ClearSpeech unit certainly seems to fulfill the claims in its magazine ads and on its Web site.

your installation. Be sure any accessories you mount are in a safe location away from passengers and clear of possible air bag deployment!) Being a powered unit, the speaker requires a connection to +12 volts DC and to ground, in addition to an audio connection to the radio. The power lead is fused, and the supplied audio connector is a standard mono 1/8" mini plug. It was interesting to note that there was a toroid on the power leads close to the

speaker but outside its case and only on the power leads. This posed a bit of a problem when mounting the speaker. Finally, the rear of the unit has a jack for (are you ready?) an external speaker. I can't think of too many situations where an external speaker needs an external speaker. ClearSpeech, in its manual, tells us not to connect headphones to this jack, as it could result in hearing damage because of high audio levels. The thought would never occur to me.

Initial test

After a few hours of disassembling the car and routing wires, it was time for the big test.

First discovery: The ClearSpeech unit requires 12 VDC to operate even when its signal processing is not active. More on that in a bit. Power up the radio with the car's engine off and the speaker's processor out of the circuit, and a moderate noise level was present. Activate the processor, and much of the noise disappeared. So far, so good! Start the car with the processor off, significant electrical noise. Activate

Continued on page 34

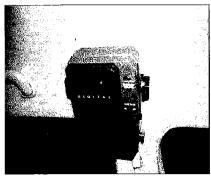


Photo A. ClearSpeech speaker mounted in author's vehicle. Note how it dwarfs the speaker used for VHF/UHF communications (below it).

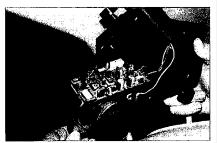


Photo B. Circuit board and speaker are accessible by removing four screws.



Photo C. Audio and power leads to ClearSpeech are mounted low on its case. Toroid is mounted on power leads outside case and is depicted as shipped from the factory. Note "Auxiliary Speaker" jack at top of ClearSpeech case.

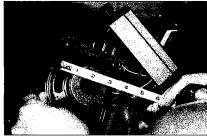


Photo D. Large speaker moves a lot of air but adds to the heft of the ClearSpeech unit.

Straight Talk about ClearSpeech

continued from page 31

the processor, much of it goes away. Great! Some driving around listening to HF stations on various bands and switching the unit on and off revealed significant improvement in the ability to copy weak signals. In certain instances, it made the difference between being able to copy or not hear the station at all!

Another benefit was the apparent reduction of noise from nearby electrical lines; the unit seems to attenuate annoying heterodynes to a significant extent. The ClearSpeech unit certainly seems to fulfill the claims in its magazine ads and on its Web site [www.amateurcommunications.com].

Some concerns

Tempted to make a contact with a fairly weak station, I picked up the microphone and put out a call on 20 meters. Uh-oh! RF feedback came through the speaker. I finished my transmission, and when I released the transmit control, I noted what seems to be the automatic gain control of the speaker's amplifier, surging forth, then cutting back on its audio output. Not a debilitating problem, but one that can cause a request for information to be repeated if the person you're communicating with is quick on the comeback.

With the radio turned off, and the speaker in the "on" position, a swirling sound can be heard through the speaker. Even with the speaker's switch in the "off" position, a slight hiss can be heard. In fairness, remember that my speaker is mounted on the pillar, next to the driver's head. If the speaker is mounted below the dash or on the rear window shelf, the sounds described would be less noticeable.

It was surprising to me, that even with its processor turned off, the ClearSpeech speaker requires power to pass audio. It also consumes power with the radio off and its processor in the off position. This situation will require one of the following when the unit is installed:

You may want to power the speaker from a circuit controlled by the ignition switch of your car.

You may want to install an on/off switch or relay on the power lead to the speaker.

You might leave the speaker powered all the time, but you run the risk of a dead battery if your car is not started for a considerable period of time. The ClearSpeech manual advises disconnecting all power sources from the unit if it is not to be used for a long time.

It would appear to this non-engineer reviewer that it would have been relatively easy for the designers to incorporate a power on/off function integral with the speaker, either using the space occupied by the existing slide switch or by adding another switch to the unit.

Another preference would have been for the speaker to operate in a "pass through" mode when there is no power to it. Again, a simple circuit or multipole mechanical switch arrangement would seem to be a relatively easy design to incorporate. There are times, when band noise conditions are low or when the car is stopped, when "pass through" operation is desired. Operating without any of the circuitry of the ClearSpeech speaker being active is not a choice.

The ClearSpeech speaker provides PLENTY of audio. A relatively large speaker moves a lot of air and it seems to have a pretty good range. When driven at levels slightly above normal, mine will occasionally buzz as though something in the cabinet is vibrating or the speaker itself may have a defect.

ClearSpeech Responds

I took some of these concerns to ClearSpeech via E-mail. Their responses

Positives:

Good noise reduction, aggressive DSP

Large speaker moves plenty of air Good factory support

Negatives:

Unit must be powered to work "Afterthought" external toroid TX/RX recovery time

to my comments were prompt and well-composed.

On the subject of power being necessary at all times, I was told that the DSP and internal amplifier circuit require 12 VDC to operate. No power, no audio.

I was also told that the slight hiss when the radio is off is normal and that the manual recommends a switched DC power source, which would (of course) eliminate the noise.

My big concern was with the RF feedback. Prior to installing the Clear-Speech unit, I had a non-amplified speaker located in the same position in the car the ClearSpeech unit now occupies. I never had an RF problem with that speaker. The ClearSpeech response to my concern was that there should be no RF feedback to the speaker. They claim to know of some truckers who run over 1 kW with the antenna mounted on the speaker brackets only a few feet from the speaker. The respondent to my note also said he runs 700 watts of RF from his motor home with no RF feedback problem. It was stated that taking power directly from the battery is an important consideration, which I admit, I did not. I tapped a circuit switched by the vehicle ignition/

,	
Power supply voltage	12.0 VDC
Max current	500 mA
Output audio power	2 watts
Input impedance	8 ohms
Max input power	2 watts
Speaker bandwidth	300 ~ 3400 Hz
Background noise reduction	> 12 dB
Tone reduction	> 50 dB
Mass	1.34 lbs (0.61 kg)
Dimensions	5.5 x 4.3 x 2.5 in. (140 x 109 x 64 mm)

Manufacturer/distributor: NCT Group, Inc., 1025 West Nursery Rd., Linthicum MD 21090; tel. (410) 636-8700

Table 1. Technical specifications.

accessory circuit in an effort to work around the lack of a power switch on the unit.

Since my communication with Clear-Speech, I have spoken to another ham who reported RF feedback with his Clear-Speech unit. The RF choke on the power leads to the unit indicates to me that they are an add-on (not built into the original design), suggesting I am not the only person to experience the problem. It must be noted that every vehicle installation is unique, and there are properties to each situation that can cause results to vary widely.

It should be added that ClearSpeech comes with a limited satisfaction guarantee. If you're not pleased, it can be returned (in its original condition and packing materials) for a refund. This would seem to be good insulation from risk if you want to try to evaluate the product as applied to your situation.

My concern about the recovery time of the unit after transmission was addressed, too. The responder said yes, there is a momentary "rush" after transmission. It takes a little more than a half-second for the processor to lock on to new noise and cancel it, according to ClearSpeech.

I also asked about the occasional buzzing from the speaker, and was told that reducing the volume could help, but if the speaker had a problem such as a broken or cracked cone, the unit would be repaired under the terms of the warranty.

Not just mobile

It is possible the ClearSpeech can be used in a number of other installation scenarios. It may be a valuable accessory if your home station is plagued by electrical noise from power lines or other sources. Another operator I know wants to try it in an aircraft installation. (He's FAA certified. Don't mess around with aircraft wiring if you're not!)

Summary

Overall, I give the ClearSpeech unit a "B" grade. It certainly does what it claims to do in terms of reducing noise, reducing listener fatigue, and adapting to changing noise situations. It's easier to operate than a freestanding DSP unit, particularly in a mobile scenario.

I believe a little more thought in the design phase would have helped the speaker immensely. Pass through audio, a power switch and moving the power line toroids inside the case would be definite improvements. Perhaps there will be a revised version or upgraded model sometime in the future. Is the unit susceptible to RF? There are too many variables in mobile installations to come to a definitive conclusion. I think the company's responses to the problem are reasonable, and its generous return policy provides the opportunity for a prospective buyer to make an informed purchase decision.

After using the unit for a period of time, I decided to keep it because of the strong job it does in reducing noise and elevating the enjoyment of HF mobile operation. That's what it's all about.



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Listings are free of charge as space permits. Please send us your Calendar Event two months in advance of the issue you want it to appear in. For example, if you want it to appear in the September issue, we should receive it by June 30. Provide a clear, concise summary of the essential details about your Calendar Event.

JUN 2-3

MARIETTA, GA The Atlanta Radio Club Hamfest will be held at Jim Miller Park in Marietta GA. From I-75 at Windy Hill Rd., go west for approx. 5 miles to Austell Rd. Take a left, go 1/4 mile to Callaway Rd., take a right on to Callaway Rd. Go 3/4 mile. The hamfest is on the right. Talk-in on 146.820(-). Setup Friday June 2nd, 9 a.m.-3 p.m.; Saturday June 3rd, 6:30 a.m.-8:30 a.m. Open to the public Friday 3 p.m.-7 p.m., and Saturday 8:30 a.m.-3 p.m. Admission \$5 at the gate. Children, under 12 years, free with an adult. 8 ft. tables \$25 inside A or B buildings. Outside space (10 ft. x 10 ft.) \$10. Outside covered space (10 ft. x 10 ft.) \$15. Camping: RV full hookups \$10. Free parking. VE exams at the First United Methodist Church, Marietta GA, starting at 9 a.m., Saturday, June 3rd. Contact Charles Golsen N4TZM, 5580 Lake Forrest Dr., Atlanta GA 30342; tel. (404) 252-3303; E-mail [cgolsen@atlanta.com]; or Ben Dasher KE4YZX, 1560 Cave Rd., Atlanta GA 30327. Tel. (404) 869-6959, E-mail [bendasher@ mindspring.coml. Please, no phone calls after 9 p.m. Eastern time.

JUN 3

GRAND RAPIDS, MI The annual IRA Hamfestival, West Michigan's largest hamfest, will be held at the Hudsonville Fairgrounds near Grand Rapids. Talk-in on 147.16 link rptr. system. Doors open at 8 a.m. for general admission. Free parking. Dealers can setup on the 2nd after 7 p.m., or after 6 a.m. on the 3rd. Bring your ham equipment, coax, computer equipment, software, books, wire, jewelry, sweat-shirts etc. to sell. Hams, bring your used equipment to trade or sell. Computer hobbyists, bring your excess hardware, software, books, etc. to trade or sell. Overnight camping is available, \$10. VE exams at 10:30 a.m. Indoor table space, 8 ft. tables \$8 each. 10 ft. trunk sales spaces, \$6. Contact Kathy at (616) 698-6627 from 4 p.m. to 7 p.m. EST. Visit the Web at [http://www.iserv.net/~w8hvq].

SPRINGFIELD, IL A Hamfest will be held June 3rd at Illinois State Fairgrounds. Enter Gate 11. This event is being co-sponsored by Sangamon Valley Radio Club & Shooting Stars 4-H Club. Talk-in on 146.685(-). Flea market opens at 6 a.m.; building opens at 8 a.m. Tables \$5 in advance. Admission tickets \$5 each. No extra charge for covered flea market

spaces. ARRL VE exams. For more details contact *Ed Gaffney KA9ETP, 13977 Frazee Rd., Box 14A, Divernon IL 62530. Tel. (217) 628-3697*; or E-mail to [egaffney@family-net.net].

JUNE 4

MANASSAS, VA The Ole Virginia Hams ARC, Inc., will hold Virginia's Olde Fashioned Manassas Hamfest at Prince William County Fairgrounds, 1/2 mile south of Manassas VA on Route 234. Talk-in on 146.97(-), 224.660(-), and 442.200(+). Indoor exhibitor space, 8 ft. tables \$30 each, with chairs and electricity. Setup 2 p.m.-10 p.m. Saturday. General admission is \$5 per person at the gate. No advance sale. Gates open at 7 a.m. Free parking. Tailgating \$5 per space (plus admission). Gates open at 6 a.m. Setup 2 p.m.-10 p.m. Saturday, Find directions, details, and hotel info at the Web site [http://www.qsl.net/ olevahams]. Dealers, contact Jack N4YIC, (703) 335-9139; Fax: (703) 330-7987; E-mail [N4YIC@arrl.net] or [patnjack@erols.com]. For general info, contact Mary Lu KB4EFP, tel. (703) 369-2877; E-mail [mblasd1638@ aol.com].

NEWINGTON, CT The Newington Amateur Radio League Hamfest will be held Sunday, June 4th, 9 a.m.-1 p.m., with setup at 8 a.m., at Newington High School, 605 Willard Ave. (Rte. 173). Talk-in on 145.45, 146.52, 224.84 and 443.05. Flea market, tailgating (\$10, two parking spots on a first-come, first-served basis), VE exams (12 noon, walk-ins welcome; pre-register with special needs). Contact Dan Miller K3UFG, (860) 206-3379 or [k3ufg@ arrl.net]. Admission \$5 (indoor and outdoor). Tables \$15 in advance, \$20 at the door. Make check payable to NARL and send with an SASE to John DiSarro KA1HQK, 134 Winslow Dr., Newington CT. 06111. For more info contact Tom Ponte WB1CZX, 99 Jeffrey Lane, Newington CT 06111; tel. (860) 666-4539. E-mail [wb1czx@arrl.net].

QUEENS, NY The Hall of Science ARC Hamfest will be held at the New York Hall of Science parking lot, Flushing Meadow Corona Park, 47-01 111th St., Queens NY. Doors open for vendors to setup at 7:30 a.m. Buyers admitted at 9 a.m. Free parking. VE exams at 10 a.m. Admission by donation, buyers \$5. Sellers \$10 per space. Talk-in on 444.200 rptr, PL 136.5; 146.52 simplex. Contact (eves. only)

Stephen Greenbaum WB2KDG, (718) 898-5599. E-mail WB2KDG@Bigfoot.com] or Andy Borrok N2TZX, (718) 291-2561; E-mail [N2TZX@webspan.net]. For info about the VE exams, contact Lenny Menna W2LJM, tel. (718) 323-3464, or E-mail [LMenna6568@aol.com].

JUNE 11

BETHPAGE, NY The Long Island Hamfair and Electronics Flea Market will be held, rain or shine, by LIMARC, 8:30 a.m.–2 p.m. at Briarcliffe College, 1055 Stewart Ave., Bethpage, Long Island NY. Amateur radio equip., shortwave radios, scanners, CB equip., power supplies, accessories, ARRL info, and the all new 50/50. Tailgate spaces \$15. General admission \$6. Children under 12 admitted free. For more info call the 24-hour LIMARC info line at (516) 520-9311; or on the Internet at [www.limarc.org]. Talk-in on the 146.850 (PL-136.5) rptr.

NEAR SUFFIELD, OH The Goodyear ARC will hold their 33rd Annual Hamfest and Family Picnic Sunday, June 11th, 8 a.m.–1:30 p.m., at the Goodyear Wingfoot Lake Park near Suffield OH, 10 miles east of Akron. Talk-in on 146.985(-) or 146.520. Admission \$4 in advance or \$5 the day of the event. One ticket admits ham, spouse, and children. Vendors (pavilion) \$10 per table, \$8 in advance plus admission ticket. VE exams available. For additional info contact Don Longshore N8QCA at (330) 733-7989; or Fred Mealy KC8BQX at (330) 665-4563.

WHEATON, IL The Six Meter Club of Chicago, Inc., will hold its 43rd Annual ARRL sponsored Hamfest, Sunday, June 11th, at the Dupage County Fairgrounds, 2015 Manchester Rd. (north of Roosevelt Rd. Rte. 38), East of County Farm Rd., Wheaton IL. Free parking. No extra charge for space in outdoor flea market. General parking at the West Gate. Sellers only at the East Gate. Handicap parking at East Gate. Gates open at 7 a.m.; buildings open to the public at 8 a.m. Talk-in on K9ONA 146.52; K9ONA/R 146.37/.97 (107.2). VE exams 9 a.m.-11 a.m. Call the 24hour InfoLine, (708) 442-4961, to preregister for testing, or for more info. Absolutely no alcoholic beverages permitted. Limited overnight RV parking with electrical hookup \$10, advance registration required. Advance tickets \$5, \$6 at the gate. Advance tickets are

available from Joseph Gutwein WA9RIJ, 7109 Blackburn Ave., Downers Grove IL 60516. 8 ft. commercial tables w/110V in the air conditioned main building, are \$15 each. Indoor 8 ft. flea market tables, no electrical hookup, \$12 each. Make check payable to Six Meter Club of Chicago, and mail with an SASE to Six Meter Club of Chicago, 7109 Blackburn Ave., Downers Grove IL 60516, no later than May 25th.

JUNE 17

DUNELLEN, NJ W2QW, the Raritan Valley Radio Club "Hamfest 99" will be held at Columbia Park, near the intersection of Routes 529 and 28, 7 a.m.-2 p.m. Setup at 6 a.m. Admission: buyers \$5, sellers \$10 (\$5 each additional space). Talk-in on 146.625(r), 447.250(r) tone 141.3, and 146.520(s). Contact Doug Benner W2NJH, (732) 469-9009, E-mail [WB2NJH@AOL.COM]; or Fred Werner KB2HZO (732) 968-7789, before 8 p.m.

JUNE 18

MACEDONIA, OH The Cuyahoga ARS will hold their 9th annual Father's Day Hamfest and Computer Show/Fleamarket, 8 a.m.-1 p.m. at Nordonia High School, 8006 South Bedford Rd., Macedonia OH. Setup is at 6 a.m. For reservations, call or fax Rich James N8FIL, (330) 468-6021; or CARS, P.O. Box 133, 526 W. Aurora Rd., Sagamore Hills OH 44067; Email [Hamfest@cars.org]. The Web page is [http://www.cars.org]. Admission \$5. Indoor tables \$11 for the first table (includes admission), \$8 for each additional table. Talk-in on 146.82(-).

MONROE, MI The Monroe County Radio Com. Assn. will hold its annual "Monroe Hamfest" 7:30 a.m.-1 p.m., at the Monroe County Fairgrounds, 2 miles west of Monroe on M-50. Indoor tables \$15 for the first 8 ft. table and 1 ticket, \$10 each additional table. Trunk sales \$6 per 8 ft. space. Overnight camping \$15. Free parking. Talk-in on 146.72. Admission \$6 in advance, includes two stubs for the drawing; \$6 at the door with one stub. Contact Fred VanDaele KA8EBI, 4 Carl Dr., Monroe MI 48162; tel. (734) 242-9487 after 5 p.m.; or E-mail [ka8ebi@arrl.net].

JULY 8

PETOSKEY, MI The Straits Area ARC's 25th Annual Swap & Shop will be held Saturday, July 8th, 8 a.m.–12 p.m., at Emmet County Fairgrounds, Petoskey MI. US 31, 2 blocks west of 131. Tickets \$4, tables \$5 (splits OK). VE exams 1 p.m. at the American Red Cross Bldg. For testing info contact Floyd KG8CS, (231) 526-5503. For general info contact Tom W8IZS, (231) 539-8459; or Dirk KG8JK, (231) 348-5043, E-mail [kg8jk@qsl.net].

SALISBURY, NC The Rowan ARS will sponsor the Salisbury Firecracker Hamfest,

Saturday, July 8th. From I-85, take exit 76B to Salisbury. Turn right at the ramp intersection with E. Innes St. Turn left on S. Boundary St. (Captain D's/McDonald's intersection). Go two blocks to find the Salisbury Civic Center — hamfest site on your left. Doors open at 8 a.m. Admission \$4 in advance, \$5 at the door. Indoor tables \$5 each as long as they last. Talkin on 146.73 (W4EXU) tone 94.8; back up on 146.52 simplex. Walk-in VE exams. For more info call Jim Morris KA4MPP. (704) 278-4960; or Carol Maher W4CLM, (704) 633-6603. Send mail to Rowan Amateur Radio Society, P.O. Box 593, Salisbury NC 28145. E-mail [rbrown@salisbury.net].

JULY 9

PITTSBURGH, PA The North Hills Amateur Radio Club's 15th Annual Hamfest will be held July 9th, 8 a.m.—3 p.m., at the Northland Public Library, 300 Cumberland Rd. Pittsburgh PA; approx. 10 miles north of Pittsburgh on McKnight Rd. (Truck Route 19). At the 3rd traffic light after Northway Mall, turn left onto Cumberland Rd. Northland is on the left at the top of the second hill. From points north, take Route 19 south toward Pittsburgh. Follow signs for McKnight Rd., and at 4th traffic light turn right onto Cumberland Rd. If on Perry Hwy.,

turn left onto Cumberland Rd. at the Sunoco, Talk-in and check-ins will be on 149.09 W3EXW North Hills Club rptr. Free admission and free parking. Paved tailgating, 1st space free; additional \$5 each. Handicapped accessible. For more info contact Keith Ostrom KB3ANK, 205 Poplar Dr., Pittsburgh PA 15209, tel. (412) 821-4135; Bob Ferrey, Jr. N3DOK, tel. (412) 367-2393, E-mail [n3dok@pgh.net]; or see the club's Web site at [www.nharc. pgh.pa.us].

JULY 28-30

FLAGSTAFF, AZ
The 49th Arizona
State Convention and
Hamfest, sponsored
by the Amateur
Radio Council of
Arizona, will be held
at Ft. Tuthill in
Flagstaff AZ. Some of
the features will be
manufacturers,
dealers, exhibits,

seminars, VE exams, a huge swap, camping, and more. Gordon West WB6NOA will present two of his famous seminars, and (TBA) will be the guest speaker at the Sat. night BBQ. Other speakers, seminars and forums include Dan Miller from ARRL headquarters, Bill Pasternak from Newsline, AMSAT, APRS, Ten-Ten, Ladies programs, QRP, and an ARRL Forum. For more info contact Amateur Radio Council of Arizona, PO Box 312, 16845 N. 29th Ave., Ste. 1, Phoenix AZ 85053-3041. E-mail [arcathill@aol.com]. Voice mail (602) 779-2722. Visit the Web site at [http://www.Hamsrus.com].

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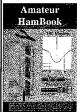
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Exploring the Kenwood TM-D700A

Part 2: A rig for all seasons.

Last month, I wrote about the many features of the Kenwood TM-D700 as a high-quality dual-band mobile transceiver. As impressive as it is, it is not its capability as a multifunction FM transceiver that sets the TM-D700A apart from the pack. What makes this rig really exciting is the fact that it is a very powerful hybrid of a radio and a computer. This radio can function as a repeater, a packet radio system, a slow scan TV station, or a complete APRS operation. The more I play with this radio, the more I find that it can do and the more fun I have with it.

The radio can function as a dual-band repeater that may prove extremely useful in some situations. I like to use a very small (and therefore low power) handheld around the house. I can hit my favorite repeaters with this, but for some nets I need a more powerful signal. By setting the TM-D700A up as a repeater, I can use the handheld set to transmit on a UHF frequency and have the TM-D700A retransmit

my signal to the 2-meter repeater. While this is certainly convenient, the real benefit would be in a disaster or emergency situation where no repeater is available to a disaster relief group. A mobile-mounted rig could be parked as close (or as high) as possible to expand coverage. Having just one more repeater available in such a relief effort can make the difference between being able to provide communications and not.

Many of the advanced functions revolve around the TM-D700A's built-in terminal node controller (TNC). TNCs were developed over ten years ago to permit radios to communicate digital information in packets. The TNC became the link between a computer and a radio in the same way that a modem is the link between a computer and a telephone line. Packet radio caught on, big, with much of the excitement being the ability to establish and maintain packet bulletin boards. The level of interest dropped off as the Internet and World Wide Web caught on, since they provided faster access to similar bulletin boards. At that time, TNCs were capable of 1200 baud, while modems jumped from 2400 band to nearly 56 kilobaud. Needless to say, bandwidth is a powerful attraction. While there are still many packet bulletin boards around today, they tend to be more specialized. Packet clusters are bulletin boards that meet the information needs of a specialized group of hams. DX packet clusters, for example, allow DX chasers to keep up on the latest activities of rare stations while trying to work the stations on HF. Another interesting application of packet is through

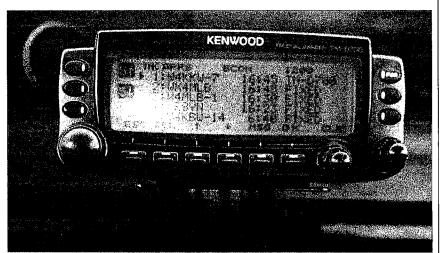


Photo A. In APRS mode, the control panel can display a list of stations recently heard. By moving the cursor to a particular station, you can recall details or send a message to that station.

TM-D700A Panels

The Kenwood TM-D700A utilizes a separate main unit and control panel. The control panel is mounted in a convenient location where it can be readily seen and the controls reached. The main unit can be securely mounted under a seat or even in the trunk. Since the control panel is easily removable from its bracket and cable, this reduces the chance of theft, especially since Kenwood has announced that it is not intending to sell replacement control panels.

The main unit has connections located on both the front and rear. On the front (Fig. 1) there is a DB-9 connector (1) used to connect to the serial port of a computer. The computer can be used to load or store frequencies to be memorized, as a terminal for packet radio operations, and to perform other control functions.

A GPS jack (2) permits the connection of a standard GPS receiver so that the TM-D700A can report its position as determined by GPS. The data connector (3) uses a DIN socket and can be used for connection to Kenwood's VC-H1 video input or for connection to an external TNC.

There are two modular connections. The first is used with the cable to connect to the control panel (4). The second is used for the microphone(5). The connectors are all different, so there is no chance of plugging the wrong item into the wrong port.

The last item on the front of the main unit is a reset button(6). As with all good computers, this is the "when all else fails" button. Don't try to plug in the GPS by feel alone, or you may inadvertently try to plug it into the reset (Oops!).

The rear of the main unit (Fig. 2) has an SO-239 connector (1) for the antenna. There is a cooling fan in the

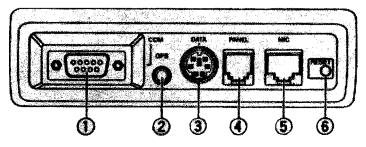


Fig. 1. Main unit front panel.

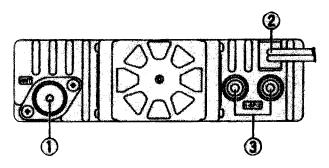


Fig. 2. Main unit rear panel.

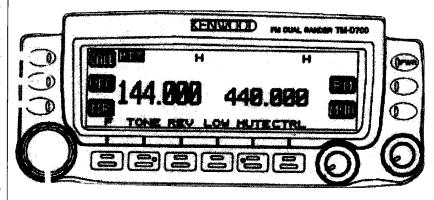


Fig. 3. Control panel.

middle. The power cable (2) comes complete with cables with fuses to be located near the connection to the power supply or battery. There are two speaker jacks (3) and, by using the software control, you can route the A and B bands to a particular external speaker or the internal speaker. Several combinations are possible.

The front control panel (Fig. 3)

includes a dozen buttons and three knobs. All but the power button are programmable and change with the radio's function. The large knob is used primarily for tuning although it also performs other functions. The two small knobs control the A and B band volume and squelch. Pressing one of them determines which band is the active band.

satellite or space station operation. A message is sent by packet to the orbiting bulletin board on one orbit and the station responds the next time it's "in the neighborhood" on its next orbit.

Since some packet stations are geared for satellite contacts, you can connect to the space station through one of these specialized stations and not have to worry about having your own altitude/azimuth circularly polarized antennas and other satellite equipment. As I write this, a crew is being sent back to the *Mir* space station, which has operated such a space-based packet

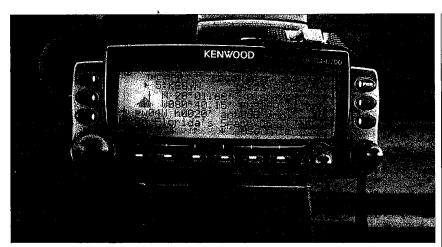


Photo B. This is the type of detail you can display about a station. In this case, the screen in my car indicates the transmitted information about my home station, including its location as latitude and longitude. Since my mobile station includes a GPS receiver, the screen also indicates the direction and distance from my mobile to my home station.

BBS in the past; the International Space Station may have such a capability once occupied.

The TM-D700A provides the radio and the TNC, so all you need to add is a computer in order to operate packet. You will need some type of program to allow you to communicate with the TNC through the keyboard. You can use either a basic terminal program to control the TNC or one specially written for such purpose which may provide a split screen. The top half often shows the incoming information while the bottom shows the outgoing data as you type it in. Packet is usually run from a fixed location, but this rig

provides the ability to run mobile packet. I prefer to think of it as relocatable packet, since the idea of operating with one hand on the wheel, one on the keyboard and eyes darting between the windshield and the computer screen is pretty scary. If the operator is a passenger, then mobile operations may work, but safety always supersedes operating a radio. In any case, a laptop computer can be connected to the main unit for portable operation. Since the TNC performs most of the work, a very modest laptop will suffice because it needs only to function as a terminal. A basic black and white model may have lower

KENWOOD

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Photo C. If you have a GPS receiver hooked to your Kenwood TM-D700A, the control panel can show key data including speed, heading, latitude and longitude, and even the current grid square.

power requirements, providing longer operating time. Don't forget that LCD displays may be difficult to see in bright sunlight, so a sunshield or even a shade made of cardboard might be necessary. A cable with DB-9 connectors can be fitted between the main unit of the TM-D700A and the serial port of the computer. As long as you've got the computer hooked to the system, you might as well try some of the other state-of-the-art capabilities of this unit.

Kenwood's Web page has a downloadable program that can be used to arrange, store, and upload frequencies, offsets, subaudible tones, etc. While this can be entered from the front panel, there's a high tech solution that's more fun. You can arrange data according to location, type of operation or other preference and maintain multiple files that can be easily and quickly uploaded from the computer to the radio. Some TM-D700A owners have begun to write their own programs to control even more features through their computer rather than the front panel. While we hams once experimented with a soldering iron and a junk box full of parts, today we experiment with a keyboard and a computer language.

One of the interesting capabilities of this unit is the Kenwood Sky Command system. Sky Command permits you to use the TM-D700A in conjunction with another data radio and a high frequency rig to operate remotely. Want to work that rare DXpedition on FlySpot Island in the South Pacific from your handheld dual-bander? No problem! Basically the Sky Command system uses a transceiver such as the TM-D700A or the TH-7 at each end. If the TM-D700A is connected to a Kenwood state-of-the-art HF rig, the UHF transceiver can be used for control functions while the 2-meter transceiver can be used for voice transmissions. The voice transmissions on 2 meters are being handled as third party traffic as it passes from one band to another.

You may have read that there have been some questions raised about this system. Actually, this is not at all surprising nor unexpected since any new and innovative approach, by definition, raises questions. You just can't make progress and maintain the status quo at the same time. In the meantime, you have to admit that this is an interesting and innovative capability.

The TM-D700A also is geared to slow scan TV. Slow scan has been a tried and true mode in the ham bands for many years, although most of us tend to think of SSTV as an activity that shows up on 20 meters around 14.230 MHz. Kenwood has been encouraging portable operations in the VHF band (don't forget that you have to move up to UHF before you can operate fast scan TV). You can use Kenwood's VC-H1 which includes a CCD camera, LCD monitor, and a slow scan converter. I expect that slow scan TV will begin to catch on in these bands in the near future. Imagine the benefit this would provide during disaster support by allowing the sending of a digital snapshot of the scene back to the command post. Then, of course, there is slow scan from a balloon or other experimental platform.

Finally, there is my absolute favorite: the Automatic Packet/Position Reporting System APRS. Even with everything else that this rig offers, nothing compares with the capability this brings to this new and extremely exciting mode. For APRS, all you have to add is - NOTHING. It's got it all. You can send and receive APRS packets automatically and continue to ragchew through the local repeater on the other. You can program in key information about your station including callsign, an icon that will show on other people's maps, and a status message. You can set it up to beacon periodically with your message being relayed through APRS stations that allow digipeating. Yes, the TM-D700A can act as a digipeater, too. You can enter location coordinates in latitude and longitude into memory; if you enter your home and work locations and key landmarks in between, you can transmit these locations as you hit them. In this way, you can indicate your progress.

However, for even more fun, you can attach a Global Positioning Satellite (GPS) receiver to the radio. GPS receivers tune to the signals from satellites and are able to determine location by mathematically comparing the signals from multiple satellites. The receiver can determine your current location, speed, direction, elevation, and distance from "way points" or other

Continued on page 58

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Chesterfield, the Holy Land, and More

By now, just about everyone has heard about the tremendous success of the Chesterfield Island DXpedition. I had a blast working this new one from home, and I hope you did, too. I was quite impressed with the operating skills and the dedication of the operators on this one.

The statistics from this group are awe some. Here is TX0DX bulletin number 15 from Tom N4GN, dated March 21, 2000:

Chesterfield operators safely back in New Caledonia

The TX DX operation went QRT on Wednesday, 29 March, shortly after 0000 UTC. In six days of operating, they completed 72,654 QSOs. The majority of QSOs were on 21 MHz SSB and CW, as per the original strategy to provide the maximum number of DXers their first-ever Chesterfield contact. However, other complementary bands and modes were activated sporadically, including 50 MHz with more than 2,500 QSOs and RTTY with some 800 stations in the log.

All the Yaesu radio equipment and Suzuki generators performed well under very severe weather conditions. The daily temperature regularly exceeded 38°C (100°F) and heavy rain was experienced often. The five FinnFet beam antennas were all at heights of 25 feet. The CW site was placed at the south end of the island, while SSB sites were located at the north end, providing 300 meters of physical separation. The Comtek 20-meter four-square performed exceptionally well.

On the way to the Chesterfields, the TX DX group made a slight detour to the area where intervening reefs are indicated on some older maps. The team was able to confirm the French Navy's documentation that the claimed islands simply do not exist. Thus, the 350-kilometer open water separation between New Caledonia and the Chesterfields is assured, and the concerns expressed by some in the DX community can be put to rest. With the recent decision to admit ARANC — New Caledonia's amateur radio society — to the IARU, the way

is now cleared for the Chesterfield Islands to be added to the official DXCC List, and no further complications are expected in this process.

The TX DX log search will be operational in approximately one week, since some of the QSOs were logged on paper as the result of two computers succumbing to the elements. No QSO data was lost; every made QSO is safely in the hands of the group.

The TX DX operating team of FK8GM, FK8HC, JA1BK, N5KO, N7NG, OH1RY, OH2BC, OH2BH, and OH2RF are pleased to be safely back in Noumea, New Caledonia, and they wish to thank the following organizations and individuals for supporting this undertaking: Yaesu Musen Co., Suzuki Co., FinnFet, Comtek, INDEXA, GDXF, F6AJA, FK8CR, JH1KRC, JK1KRS, N4GN, OH2BN, K6GNX, W5IZ, W6OTC, VK3EW, and all their family members back home.

Tom's bulletin mentions a log search routine-that was pending. In case you haven't gotten the details yet, it has been available since early in April. You can obtain a listing of your entries in the TX0DX log by sending an E-mail to [tx0dx-log@n4gn.com], with your callsign at the beginning of the subject line. You do not need to enter anything in the body of the E-mail. You will receive something that looks like this:

"The TX0DX Chesterfield Islands DXpedition was made possible by the generous support of Yaesu Musen Co. Ltd., the International DX Association (INDEXA), and the German DX Foundation (GDXF).

"Based on the SUBJECT line of your E-mail request, the TX0DX 2000 DXpedition HF log book was searched for the callsign 'N6NR' and the following QSOs were found (call, band, mode):

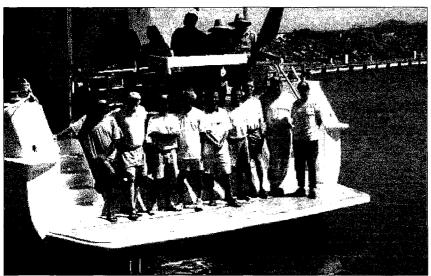


Photo A. Martti and gang put a new one in the water!! Photo courtesy [http://www.n4gn.com/tx0dx].

Top of Form Clear Callsion Search Log Enter Callsion: Bottom of Form

> 4W/W3UR QSL manager is Jarmo, OH2BN. Jarmo's address is:

> > Jarmo J. Jaakola Kiilletie 5-C-30 00710 Helsinki FINLAND QSOs with N6NR

> > > Band Mode SSB 15m

A total of 1 QSO was found

This log contains 9,191 QSOs from 26-Mar-2000 1437Z through 2-Apr-2000 2302Z

Photo B. This is what you will see on the 4W/W3UR log server Web page. As you can see, I just barely made it.

N6NR 20S [20 SSB]

N6NR 15C [15 CW]

N6NR 12S [12 SSB]

N6NR 10C [10 CW]

Total number of N6NR QSOs found in TX0DX log: 4

... The TX0DX E-mail log search was developed by Tim N4GN [n4gn@ n4gn.com].

Copyright (c) 2000 Tim Totten N4GN, All rights reserved."

So now you know how many times I worked them, eh?

Once again congratulations, and a hearty THANK YOU to the team. Stay tuned for some more details and photos next month.

The Daily DX heads to Timor Timur

Having lived in Indonesia for a time myself. I was excited about the news of several hams heading off to East Timor to put this new one on the air. Among several hams who went was The ARRL's own Bernie

McClenney W3UR, of The Daily DX and How's DX? fame. Bernie was originally scheduled to operate with the call 4W6DX,

but his operational authorization was later modified to include the call 4W/ W3UR. His trip to East Timor was not without hardship. I have made that trip myself, and it's no picnic. I am looking forward to including some of his those of you who are devoted readers of 73.

In the meantime. I want to make sure that all of you who collect OSLs have

narrative in next month's column for

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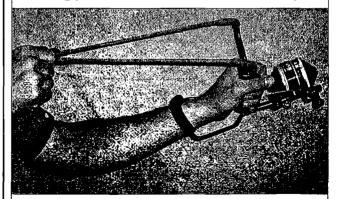
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Photo C. AC6V sports an excellent Web page at [http://www.ac6v. com/pagedx.html].

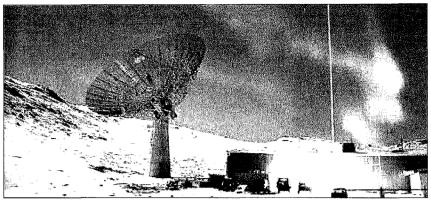


Photo D. Here is the 32-meter dish that will be used from OX2K.

the opportunity to firstconfirmthefactthatyouareinthelog. The URLis: [http://www.dailydx.com/4W6DXlog.html].

Bernie's QSL manager is Jarmo J. Jaakola OH2BN. His mailing address is Kiilletie 5-C-30, 00710 Helsinki, Finland. Bernie made over 9,000 Qs in his short stay on the island. I hope you're in the log!

On the horizon ... upcoming DXpeditions

Here are some noteworthy DXpeditions that have come to us from AC6V's Web page at [http://www.ac6v.com/pagedx.html]. The first announcement is that of an Earth-Moon-Earth (EME) DXpedition to Greenland. This is a big deal for the moonbouncers among us. The period of operation is May 29 to June 5, 2000; using the callsign OX2K, for "Greenland 2000."

Skywave communication is planned to be on 160–6M. EME communication will be via a previously installed 32-meter dish that will have feeds for 2M, 432, and 1296. Here is some of the information on the event from Bo OZ1DJJ/OX3LX, which can also be found at the following URL: [http://www.qsl.net/ox2k/].

History

In 1988, Claus OZ1FDH and I, OZ1DJJ/OX3LX, made the first contact from Greenland via the moon (Earth Moon Earth). The idea of making a bigger VHF DXpedition was born after contacts with W5UN and KB8RQ. After visiting the 32 meter dish in Sondrestrom, the idea of an EME DXpedition seemed very possible. After talking to Holger OX3HI, who lives near the dish in Sondrestrom, it was evident

to us that we could use the dish in some way but not on allband. After Michael OZ2ELA/OX3LG, a well-known HF/VHF/ UHF/SHF DXer in 1998, began working at TELE Greenland. the idea of an EME DXpedition took a very fast turn. I will like to give credit to Michael for his enthusiasm in this project. Without him, I do not think we would have seen an EME DXpedition in this scale. Thanks, Michael, and also special thanks to Holger for making it possible for us to come to Sondrestrom.

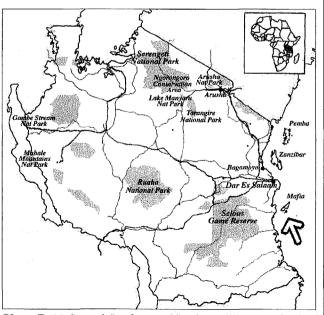


Photo E. Mafia and Pemba straddle the well-known island of Zanzibar on the east coast of Tanzania.

Objectives

The objective of this EME DXpedition is to make as many contacts via moon on 2 m, 70 cm and 23 cm as possible. We will also be active round the clock on 6 m and shortwave. Also, the intention is to put Greenland radio amateurs on the world map and show how friendly and beautiful this country is. We hope one day other radio amateur or other travelers can share what we will experience. Another goal is to try to make it easy for other radio amateurs to go on DXpedition to Sondrestrom in Greenland. We will have six different stations, so we are able to be on the air at the same time on all bands. The crew is about 25 operators.

Operating skeds

Bo OZ1DJJ/OX3LX, is the Sked Manager for the DXpedition. He can be reached at his E-mail only. When requesting a sked or just wanting to notify the team that you will be looking for us, please specify your station, e.g., antenna, power, etc. Please also write how, when, and where you can be active so we can get in contact with you, through E-mail(s), phone numbers, and short messages. It may be that we can only operate random on 23 cm — thus instant skeds may also happen.

Mafia and Pemba Islands

In June Bert PA3GIO will be traveling to Mafia (AF054) and Pemba (AF063) Islands off the east coast of Tanzania. This will be a "double-header" of sorts for a couple of reasons. First, there are a whole bunch of folks who are in need of these IOTAs. Second, Bert's DXpedition will involve some island hopping. He will be on Mafia Island from the 18th to the 24th. He will then travel to Pemba Island from May 25th to June 1st. Operation is planned on 80-10 (SSB only), with the exception of 30 meters. You can learn more about this trip at: [http://www.qsl.net/pa3gio/5H3/].

Lesotho

In July at team of German hams will be heading to Lesotho, and will be using the call 7P8AA. They are scheduled to depart on my birthday, July 2nd, and will stay until July 22nd. The team is comprised of Jeorg DF6VI, Dieter DJ9ON, Markus DL1AN, Hans (aka Jack) DL1YFF, Tom DL1QW, and Tom DL4OCM. Some of these names should be familiar to you. They will run three stations — SSB, CW, and RTTY, and will cover 160 through 6 (including WARC).

QSLs should go to Fritz Bergner DL7VRO, Sterndamm 199, D-12487 Berlin, Germany. For more information point your browser to: [http://www.gsl.net/7p8dxpedition2000/]. My thanks go out to AC6V for compiling this information.

4X2K: Israel's 2000 years of history in the Holy Land award

My good friend Moni 4X6ZK just reminded me of a new award that is being offered to amateurs of the world by the Israel Amateur Radio Club. This is the 4X2K award, and is specifically intended for the promotion of awareness of historical sites in Israel that are related to the beginning of Christianity in the Holy Land. Detailed information about this award may be found on the Hagal Web site [http:// hamgate.netvision.net.il/hagal/], which, if my memory serves me correctly, is maintained by 4X6LM, who lives close to Moni in Holon. He lists the following as the primary purposes for this award:

Purpose and goals

- 1. To enhance and develop historical sites in the Holy Land.
- 2. To help reforesting and development of nature and recreational areas around the historical sites.
- 3. To promote historical awareness of the region.
- 4. To encourage portable and mobile HF operations.
- 5. To establish contacts with amateurs from all over the world.
- 6. To encourage foreign amateurs to come and operate from these historical sites.

This award applies to QSOs with stations in Israel made between January 1st and December 31st, 2000. To qualify for the award, you must contact at least five of seven historical regions defined by the award committee, and accumulate a total of 300 contact points. The points are accumulated according to the following criteria:

Credits and points

- 1. A QSO with a station operating from a major historical site gives 5 points.
- 2. A QSO with a Holy Land station located outside the major historical area gives 1 point.
- 3. The special event station 4X2K will operate throughout the year. A QSO with this station gives 20 points; for example, if 4X2K/3 operates from Jerusalem, a QSO with this station gives 20 points, and a credit of area 3 for Jerusalem. Each area may count only once for the award.
- 4. All OSOs made during the Holy Land contest will count double points.

Major historical sites

7 major historical sites related to the life of Jesus were selected. Each is marked with a number:

- 1 Bethlehem
- 2 Nazareth
- 3 Jerusalem
- 4 Tiberias and the Sea of Galilee
- 5 Galilee (excluding Tiberias and the Sea of Galilee)
 - 6 Samaria
 - 7 Judea

Stations may be worked only once for each region, which implies that they may be worked again whenever they move to another region. A QSO is considered valid when there is a successful exchange

7P8 Lesotho DX pedition 2000

Photo F. In July, a team of German hams will be heading to Lesotho and using the call 7P8AA. They are scheduled to depart on my birthday, July 2nd, and will stay until July 22nd. The team is composed of Jeorg DF6VI, Dieter DJ9ON, Markus DL1AN, Hans (aka Jack) DL1YFF, Tom DL1QW, and Tom DL4OCM. Some of these names should be familiar to you. They will run three stations - SSB, CW, and RTTY - and will cover 160-6 (including WARC). QSLs should go to Fritz Bergner KL7VRO, Sterndamm 199, D-12487 Berlin, Germany. For more information, point your browser to: [http://www.qsl.net/7p8dxpedition 2000/1. My thanks go out to AC6V for compiling this information.

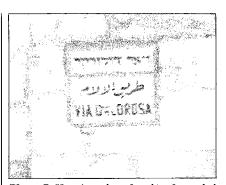


Photo G. Here is a photo I took as I traveled the Via Doloroza (Avenue of Misery) in Jerusalem — just one of the sites featured in the 4X2K award celebration.

callsign, and the major historical area number, signal report of the 4X station. Stations located outside the major historical areas need only send their callsign and signal report.

The fee for this award is nominal, only \$10, or 12 IRCs. However, the benefit goes well beyond that. Included in the fee is the cost associated with the planting of one tree by the Forestry Department in one of the

Continued on page 59



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Jack Heller KB7NO P.O. Box 1792 Carson City NV 89702-1792 [jheller@sierra.net]

Timewave's DSP-599zx

I was reading the short description of one of the new Icom rigs and thinking how nice that would be for the PSK31 reception where there are some very strong adjacent signals. The new 756PRO claims over 40 programmable IF filters, which makes it my kind of radio except for one small problem: It doesn't fit the budget. So, I thought it was time to experiment with one of the magic boxes sitting here that I just hadn't given a chance on the PSK31 mode. This would be the Timewave DSP-599zx. One ham had mentioned he uses his with remarkable results, but it took a while for me to make the effort.

In this case, the effort was practically all done except for plugging in some already made-up cables that I have ready for SSTV. It was even easier, as I ran the 599zx from the speaker jack on the radio, figuring to adjust the volume control appropriately at the radio to avoid overloading the sound card. It worked first time, just like plug 'n' play.

It was only necessary to adjust the volume and to adjust the 599zx in the CW mode to get the correct audio center frequency and experiment with width. The center frequency seemed to need to be changed from time to time as I experimented. At the end of an hour or so, I discovered the reason. The frequency of the sound card had shifted over 150 Hz, probably due to my tinkering with the 599zx.

That shift would never be noticed during normal operation, except that it is necessary to keep the waterfall display centered on the signal to keep from clipping one side of the signal when the width is tightened down to 35 Hz. This, you will find, is easily adjusted by changing the center frequency on the 599zx. The starting point is about 1040 Hz, and after a while it becomes as much as 1,100 Hz. Not a problem, as long as you watch for it.

The first contact was on 10 meters. There wasn't any real noise problem, but that was the band where the radio was last used, and there was a QSO in progress. I gave Dick N1RCT a call as he signed with the other station, and we discussed this hookup. It seems Dick had already given this a try, and was currently using one of the other popular DSP units.

There are pros and cons to be heard from users, but it is generally agreed there are definite advantages. It was easy to see the effects of the unit, while using the Logger program, which has both a waterfall and a spectral display in the tuning indicator. The waterfall, as I mentioned, is useful for setting the center frequency. (See Figs. 1 and 2.)

The spectral display tells many additional stories. And some of the stories are nearly unbelievable; you have to see for yourself. Just for openers, once a signal is tuned and the filter is set properly, the only thing in the spectral display will be the signal that is being printed on the screen. All the noise and any adjacent PSK31 signal is out of sight.

Fortunately, as any good filter must allow, the 599zx can be disabled with the toggle of a push-button and the rest of the spectrum can be observed. I was listening to a 20 meter QSO when a PACTOR signal started up and was centered precisely on their operating frequency. Interestingly, neither station was severely affected by the intrusion with the regular PSK31 software they were using, but I had 100% copy of both signals as long as the filter was in place. Both of the stations complained of losing a certain percentage of the other's transmission. So, I thought, this really works.

To continue, this seemed to be a day when the activity was a little light, so I tuned carefully with the filter in and out of the process for comparison. If you have ever gone exploring with a really narrow filter you already know it is very difficult to not pass over signals, so you learn quickly to disable (by-pass) the filter for casual tuning.

The problem, this day, was that most of the signals that were on the air were down in the mud. They didn't even show in the spectral display, much less in the waterfall. This soon became a very good test.

The next move was to adjust the filter width to about 100 Hz and tune very carefully (that means excruciatingly slowly). As you may have noticed, one of the telltale

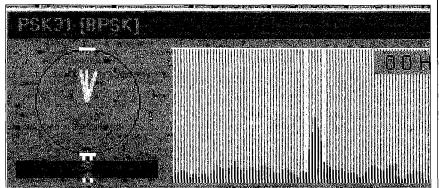


Fig. 1. Here you see the spectral display and waterfall from the Logger tuning indicator with the 599zx in by-pass mode.

signs of a signal is a change in indicator color from red to yellow, but that usually takes a second or two after you have "found" the signal. This translates to passing right over a weak signal if you do not exercise extreme patience.

Normally, signals that difficult to tune are not readable. This was the dawning of a new day. I was finding signals that did not register on the waterfall, nor did they display recognizable peaks on the spectral display. Simply said, the slow tuning was paying off, because when there was a change of color, I could stop and examine the peaks in the spectral display and tune either on a peak or between two of them and a signal would magically materialize. It would not be audible from the speakers nor would it display in either tuning indicator, but it would be causing legible print. This happened several times across a "dead" band.

This may sound as if I found the answer to all interference with the additional hardware, but there are a few things it doesn't cure. Number one is that the loud adjacent signal which blanks the band, usually PACTOR, will still do just that. It doesn't happen too often, but I used the 599zx long enough to confirm that the problem did not go away.

There is one other problem I became aware of that relates back to the frequency shift caused by the software. When conditions get far enough "out of shape," it becomes very difficult to quickly tweak the 599zx back to 100% print. I found that this happened with a perfectly good signal when some adjacent QRM came on the scene, and the best thing to do at the time was to resort to the ever-faithful PBT with the 599zx out of the loop.

Some education came to me also as I was running this experiment. I saw something happen I had heard about a few times in the past. As you recall, I was using the speaker output to the 599zx direct. This worked okay, as I could control the level with the audio control on the rig. What I saw was the waterfall occasionally turn red when the level was too high. This is a sign of overdrive I had never experienced with the constant audio level from the jack on the back of the rig. Sometimes the PACTOR signals would come up and cause red lines in the waterfall. Now I have an answer to a question from experience that I never would have had.

So, was I impressed? Absolutely. There is definitely room for better filtering. All things being equal, with no super strong interference, the outrigger audio DSP units can give you a lift. This one did. The best is still going to be IF filtering. It can be done.

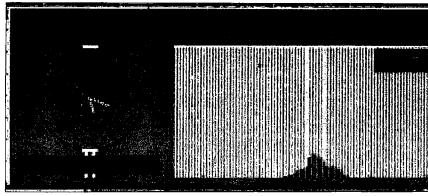


Fig. 2. This is a shot with the 599zx set at 35 Hz width. Note the absence of adjacent signals or noise in the spectral display. Also note that the waterfall is clean and centered. One drawback to this is you must concentrate on visual tuning. Anywhere you move the receiver dial, the sound from the speaker will cause you to believe you are hearing a PSK31 signal. Initial tuning is much easier with the 599zx in bypass mode. See text.

Perhaps by the time next month rolls around, I will have found the answer.

I should put it this way. The Timewave unit is a good piece of equipment and is easily adapted to this mode. If you have one or have access to it, give it a try. If you like RTTY or any of the "normal" modes, it makes them come alive. I don't think I

would purchase the unit simply for the use I put it to today on PSK31, but I find it nearly indispensable for other modes such as RTTY.

I was thinking that there is another trick piece of software that could possibly work here, but I don't think so. The folks at ChromaPIX who developed the ChromaSound program came to mind. The problem here is that program would have a real conflict with the PSK31 sound card program, because they can't both use the same sound card at the same time. However. if someone would like to install a second sound card - Well, let me know how it turns

I have talked to some folks with

Kenwood rigs who make a provision to use a narrow IF (CW) filter for receive mode only. I am not sure about Yaesu. I have run across a fairly complex piece of software that is supposed to make that possible for the Icom rig I am using.

Continued on page 50

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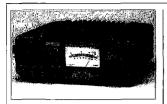
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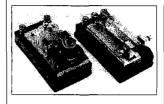
Alinco Power Supply

Alinco USA has announced the DM-330MV, a new communications-grade power supply. The DM-330V is compact (only 2.6 inches high, less than 7 inches wide and deep) and lightweight (less than 5 pounds), yet provides up to 30 amps continuous (32 amps peak) at 5 to 15 volts variable output.

In what is believed to be an industry first, there is a user-selectable "memory" preset voltage, along with a lighted meter that displays volts or current and a triple internal protection system against short circuits, overload, and overtemperature conditions.

Other features include: noise offset circuit; ripple less than 15 mV p-p; rear panel binding posts (32 A); two sets of snapin terminals (5 A each); front panel cigar outlet (10 A); memory, power, and protection indicators; and quiet fan on rear panel.

For further information, contact Alinco USA, 438 Amapola Ave., Suite 130, Torrance CA 90501; tel. (310) 618-8616; fax (310) 618-8758.



Finger Tappers™ Keys

Morse Express has announced the availability of a new single lever paddle and straight key made in California by Jim Richards KD6VDH.

The straight key is a medium-size key machined from solid brass stock and mounted on a polished hardwood base with rubber pad underneath. The knob is very unusual, with a brass cap and wooden base, and is surprisingly comfortable

during extended sending sessions. The trunnion is mounted in full race bearings with adjusting screws.

The Finger Tappers single lever paddle is a classic machined-brass-on-wood design, and a lot of fun to use. Contact spacing can be precisely adjusted for a very light touch, and it can easily be configured as a "cootie key."

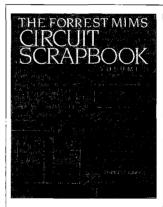
Each of these Finger Tappers is \$99.95. For further information or to order, contact Morse Express, 2460 S. Moline Way, Aurora CO 80014-3155; tel. (800) 238-8205 to order, (303) 752-3382 for info; [n1fn@MorseX.com]; [www.MorseX.com].



New Bird Power Meter

Bird Electronic Corporation has announced the Model 5000 THRULINE digital power meter, the industry's first handheld directional RF power meter combining a digital display with the ability to accurately measure power in both analog and digital RF systems. The Model 5000's compact 8- x 4-5/8- x 1-3/4-inch size, rugged construction, and rechargeable NiMH battery make it ideal for use in the field. It provides average, true average, or peak measurements of 0.1 to 10,000 watts with ±5% accuracy, and automatically calculates VSWR, return loss, and match efficiency.

For further information, contact Ms. Lisa Weist, CSR, Bird Electronic Corporation, 30303 Aurora Rd., Cleveland OH 44139; tel. (440) 248-1200, ext. 2226; fax: (440) 248-5426.



Circuit Scrapbook Volume I

This book by famous author Forrest Mims III offers a wealth of information and ideas, all originally published in *Popular Electronics*. In this volume (there is also a second),

he deals with analog computers; color organs; digital PLLs; frequency-to-voltage and voltage-to-frequency converters; interval timers; LED oscilloscopes; light wave communicators; magnetic field sensors; optoelectronics; pseudorandom number generators; tone sequencers; and much more.

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For further information, contact LLH Technology Publishing, 3578 Old Rail Road, Eagle Rock VA 24085; tel. (540) 567-2000; fax (540) 567-2539; E-mail: carol@LLH-Publishing.com.

Marine Radio Control

Creative Services Software has now introduced radio control software for the lcom M700PRO and M710PRO/R. This 32-bit software, for the mariner and ham running Windows 95/98/NT/2000 and an Icom marine radio, also includes an NMEA interface cable (clone port).

Features include: remote frequency control via virtual knob or arrow keys; remote antenna tuning; remote mode changes; real-time meter signal display; and free version 1.x upgrades. \$49.95.

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THE DIGITAL PORT

continued from page 47

I made another attempt at this very promising piece of software intended to take advantage of the narrow CW filter when receiving PSK31. It will take more time. I will not elaborate; I have sent a query to the author. It appears I have a conflict with other configurations between the computer and the Icom 735. However, if I can make this work, it may well take care of the very strong signals that occasionally blank the PSK31 portion of the band. I will let you know.

The PSK31 community is certainly livening up. I hear more activity all the time. At the time of this writing, it is a fairly normal event to turn on the rig and hear Europe on 28.120 PSK31 in the mornings from this western end of the States. And it is not unusual to work them. That propagation will likely subside by summer, but it gives an idea what to expect.

Another day, I got a chance just before noon to listen on ten meters. I copied a few European signals and contacted an Italian station. Then a Spanish station gave a call. I was sure I was onto something, but ten meters simply has ten meter propagation and it went dead by noon, almost on the dot. Fun times though.

While I was experimenting with the 599zx today, I copied an HA9 from Hungary, though not well enough to work. This was on 20 meters. He was one of the stations way down in the mud. At the appropriate time, I am sure he would have made my day.

A recent E-mail from Les WA7HAM reminded me of another fine rig that also has an abundance of IF filtering combinations. Les has been using the Ten-Tec Pegasus with good results. He has been using Logger and had a complaint about having to click back and forth between screens to take advantage of all the features.

After reading my April review of DigiPan, he jumped on the bandwagon, got his own copy, and found a new ease to operating PSK31 with his fancy digital rig. The real advantage is the simplified tuning process with the wide spectrum display of the program. He simply moves between displayed signals by clicking with the mouse, and keeps the DigiPan screen up all the time. He likes that.

That reminded me of an old note I had from a ham who had found he could work with the Pegasus software and his favorite PSK31 software more simply yet. He found that his larger monitor (I don't recall the size) would allow the placement of all the software screens so that he could avoid minimizing and maximizing continuously. Of course, those large monitors carry a hefty price tag, but you simply tell the XYL, "Everyone's doing it."

Speaking of XYL approval, I came close to convincing the wife of what a great need I had for the new Icom radio mentioned earlier. Well, at the time of this writing, I found most vendors do not have the rig listed as available. Saved her day!

But, you know what? I can still have almost as much fun with the little radio I have working. That is part of the secret to success in this hobby. If we can simply be satisfied for a time with that which works, we still meet each other at about the same rate each day, and, conditions permitting, exchange ideas and enjoy good company.

I goofed. A while back, I reviewed DigiPan and Bob Furzer's scope program. Following that, I received requests for URLs where these programs are located. They are now dutifully added to the Chart. Thanks for your patience.

One short note. I had a session with the

Source for:	Web address (URL):		
TrueTTY — Sound card RTTY w/ PSK31	www.dxsoft.com/mitrtty.htm		
Pasokon SSTV programs & hardware	www.ultranet.com/~sstv/lite.html		
PSK31 — Free — orig. PSK31 — also Logger	http://aintel.bi.ehu.es/psk31.html		
Site with links to PSK31 and Logger 6.12	www.mysite.com/k5fq		
PSKGNR — Front end for PSK31	www.al-williams.com/wd5gnr/pskgnr.htm		
Digipan— PSK31 — easy to use	http://members.home.com/hteller/digipan/		
Scope program by Bob Furzer	www.chroniclenetworks.com/~dwm/Logger.htm		
TAPR — Lots of info	www.tapr.org		
TNC to radio wiring help	http://freeweb.pdq.net/medcalf/ztx/		
ChromaPIX and ChromaSound DSP software	www.slliconpixels.com		
Timewave DSP & AEA products	www.timewave.com		
Auto tuner and other kits	www.ldgelectronics.com		
XPWare — TNC software with sample DL	www.goodnet.com/~gjohnson/		
RCKRtty Windows program with free DL	http://home.t-online.de/home/dl4rck/ [use lowercase DL4RCK]		
HF serial modem plans & RTTY & Pactor	http://home.att.net/~k7szl/		
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Source for BayPac BP-2M & APRS	www.tigertronics.com/		
BayCom — German site	www.baycom.de/		
BayCom 1.5 and Manual.zip in English	www.cs.wvu.edu/~acm/gopher/Software/baycom/		
N1RCT site — excellent RTTY ref.	http://www.megallnk.net/~n1rct/		
Int'l Visual Communication Assn. — nonprofit org. dedicated to SSTV	www.mindsprlng.com/~sstv/		
Creative Services Software	www.cssincorp.com		
Hellschreiber & MT63	www.freeweb.org/varie/ninopo/iz8bly/index.htm		

Table 1. The chart from Hell(er) — your guide to good things on the Web.

Amateur Radio Via Satellites

Andy MacAllister W5ACM 14714 Knights Way Drive Houston TX 77083-5640

Field Day 2000

In the last column, we investigated the basics of a functional home station for OSCAR operation. OSCAR is an acronym for Orbiting Satellite Carrying Amateur Radio. Now it's time to put all of the information and skills together for a successful outing during this year's Field Day exercise.

he American Radio Relay League Field Day is always scheduled for the fourth weekend in June. This year that occurs on June 24th and 25th. We have a few new lowearth-orbit satellites for extra points in the ARRL competition, or for the AMSAT (Radio Amateur Satellite Corporation) activity. The AMSAT rules last year worked well. and will show little if any change for 2000. The first-place emergency power/ portable station will receive a plaque at the AMSAT General Meeting and Space Symposium in Portland, Maine, in October. Certificates will be awarded this year for second and third place portable/emergency operation in addition to a certificate for the first-place home station running on emergency power. Stations submitting high, award-winning scores will be requested to send in dupe sheets for analog contacts and message listings for digital downloads. Check the AMSAT Web page at the URL [http://www. amsat.org] for details. The Field Day information is down a few levels under the "activities/amsatfd" subdirectories. The rules will also be published in the AMSAT Journal, or can be obtained for a self-addressed stamped envelope from me, W5ACM.

There are some good reasons to check out the AMSAT rules if you are serious about chasing satellites on Field Day. The ARRL sees satellite contacts lumped together as a single band, even though there are many satellites to work. The AMSAT rules recognize the individual hamsats as separate bands, thus promoting the pursuit of all of the "birds" for the duration of the event. AMSAT also awards points for digital satellite activity. Special Field Day messages are sent to the "digisats" for download points by anyone who can receive them.

Making choices

It would be nice to try to work every active hamsat in the sky on Field Day, but it's just not possible without a lot of gear and a lot of club members or active participants in the satellite chase. The best thing to do is to pick satellites that have transponders, either analog (voice and CW) or digital (1200 or 9600 baud), for which you have equipment.

If you are considering only the FM voice satellites like UoSat-OSCAR-14, AMRAD-OSCAR-27, or SUNSAT-OSCAR-35, don't, unless you are simply hoping to make one contact for the ARRL rules bonus points. The FM voice satellites turn into a solid FM-repeater pileup during Field Day. Typically, one or two stations will dominate the majority of a pass. They will have a few successful contacts, while most hopefuls can only listen. The lowpower, portable stations we have described in recent months just won't cut it in the face of this type of congestion. It's fun listening, but that's not what Field Day is all about.

If you have worked the satellites on Field Day in recent years, you may have noticed that a lot of good contacts can be made on some of the less-populated, low-earth-orbit hamsats like Fuji-OSCAR-20, Fuji-OS-CAR-29, and RS-13. During a typical workweek, contacts are few and far between, but during Field Day the transponders come alive like 20 meters on a weekend. The good news is that the transponders on these satellites will support multiple simultaneous contacts. The bad news is that you can't use FM — just low duty-cycle modes like SSB and CW. AMSAT-OSCAR-10 can also be a lot of fun on Field Day if the solar panels are properly illuminated and it is in a good position in the sky for Field Day. Plot some orbits and check it out.

Equipment

The best radios for Field Day are the ones you use at home, unless, of course, they are heavy antiques. My previous satellite radios included two HF transceivers, an integrated transverter system, and multiple external power amplifiers. The radios didn't transport well, and there always seemed to be at least one cable that got left behind.

If you have one of the newer, all-in-one, do-it-all HF/VHF/UHF transceivers, take it with you. If you don't have one, find someone who does and borrow it. Make sure that you practice prior to the event. There's nothing worse than trying to figure out a strange radio while you are hunting for a satellite, keeping tabs on uplink and downlink frequencies, and adjusting for Doppler, all at the same time.

Be prepared to at least work SSB and CW on Mode A (two meters up and 10 meters down) via RS-13 and Mode J (two meters up and 70 cm down) via the Fujis. If you have a good 10-meter antenna, RS-15 Mode A can net some contacts. With a nice set of two-meter and 70-cm directional antennas, AO-10 can be a lot of fun on a good day.

Unless you have experience with low-power satellite work, don't try satellite "QRP" on Field Day. It's really hard even for the best satellite operators, and can be quite difficult and disappointing to demonstrate to potential newcomers. There are too many inexperienced satellite operators on the air during Field Day, and many are trying to deal with noisy generators, bugs, and unfamiliar radios. Listening for weak stations is too much to ask of them.

Have at least 50 watts available for your transmitter uplink for all modes. A backup rig or two may save your outing from disaster. Bring at least one extra system

along. Even if you never have to unpack it, the insurance is worth it.

Antennas

A simple system for RS-13 Mode A can

get by with a dipole in the trees for 10 meters and a ground plane in the clear on two meters. Most serious satellite operators will have an antenna system that will rival many home stations', with large circularly-

> polarized yagis positioned by azimuth and elevation robetween these ex-

Some innovative omnidirectional antennas like "egg beaters" can be effective for VHF and UHF work on good passes. Check out some of the designs and ideas proposed by Jerry K5OE, Lee KØLEE, and John KD6PAG on their Web sites: [http:// members.aol.com/ k5oejerry/], [http:// members.aol.com/ lee810/ham.html]. [http://www.qsl.net/

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Predictions

Don't assume that you can take a laptop computer to Field Day and do your predictions after you get there. Plot all of your potential satellite passes in advance for every satellite you intend to pursue. Check the results. Look for timing conflicts. Make sure that the coordinates of the Field Day site and recent satellite element sets have been entered into the software. Don't forget to take along some satellite frequency guides unless you are one of the few who has memorized all the uplink and downlink bands for all of the hamsats in orbit.

Power and interference

There is nothing worse than having all the gear, antennas, predictions, and accessories ready to go, and then discovering that you can't hear anything but noise on the downlink frequencies. It happens a lot. Noisy power sources are the #1 culprit. If you can operate with batteries, do it. Satellite chasing is considered weak-signal work. Most of our hamsats only have a few watts output to simple antennas. They can be hard to hear. A typical consumergrade gasoline generator can produce a lot of noise in the RF spectrum. Be sure to test your generator prior to Field Day. Check it with your satellite rig for a few passes. If it is noisy, either cure the problem or get another generator or power

Don't forget about "the other guy." Most Field Day operations include multiple stations for HF, VHF, and satellite work. The folks in the tent next door on 10 meters can ruin your best attempts to make Mode-A contacts. Coordinate with them so that they can go to another band or take a break during those short intervals when the RS hamsats come by.

If your group operation has any terrestrial VHF stations or two-meter packet systems, they can destroy any chances you might have had hearing AO-10 on Mode B (70 cm up and two meters down). As with the HF folks, make your intentions known and arrange for an operating schedule in advance. Even with all these precautions, it is always a good idea to isolate the satellite station from the others. A high-power 20-meter SSB rig will almost always mess with a 10-meter receiver just a few feet away.

Have fun!

You may ask, "How can he say 'have fun' after all of those warnings?" I have to admit that I have been chasing satellites on Field Day for 20 years, and I am really looking forward to doing it again in 2000. We have had multiple rig failures, antenna failures, computer glitches, generator disasters, tropical storms, and even satellite problems, but it has always been fun. Every year, we learn something new. We try different gear. We demonstrate satellite operations to hams who didn't even know that the hamsats existed. We learn more about emergency, portable operation. We test our equipment. And, finally, we have fun doing it!

I'll see you on Field Day!

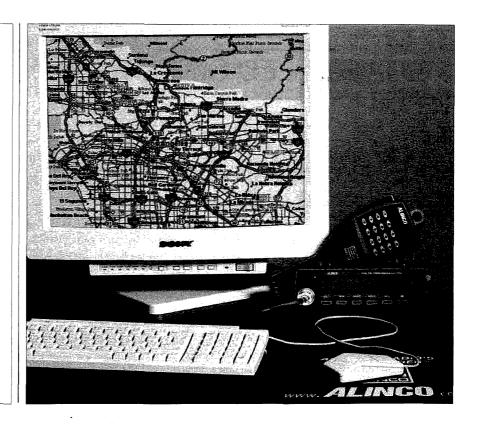
On the cover this month, the screen shows busy APRS activity in Southern California captured by the new Alinco DR-135TPG and APRS Plus software developed by Brent Hildebrand KH2Z for use with the DeLorme Street Atlas program.

The new 2-meter mobile features an internal TNC for packet and APRS; operates at 1200 or 9600 bps; and has a rear-panel DSUB9 computer connector, 100 memories, a large 7-digit alphanumeric display, GPS input port, ignition key on/off, theft alarm, CTCSS and DCS encode/decode, 50/10/5 watts output, wide and narrow FM modes, autodial memories, and more.

It can also be ordered without the TNC, which can be added later.

APRS is a trademark of Bob Bruninga WB4APR, creator of the popular geolocating program.

For specs on the radio, see [www.alinco.com]; for APRS info and downloads, visit [www.tapr.org].



NEUER SAY DIE

continued from page 4

the so-called educational establishment, aren't going to want to believe this. Frankly, until I read about it in Iserbyt's the deliberate dumbing down of america, it just never occurred to me. And that's the beauty of this subversive system — none of us thinks about it. We just accept it as the way things are.

We know that our educators must have chosen the things we're going to be taught in school for some very good reasons, which may not be evident to us at the time.

Well, Iserbyt has done the research and she quotes the educators, who established our school system. It turns out that there's a whole lot more to this New World Order baloney than I suspected. I'm so damned sick of the conspiracy fanatics who are blaming things on the New World Order, the Council of Foreign Relations, and so on, but never provide any proof to back up their rantings. Iserbyt has the proof! I hate it when fanatics turn out to be right.

In the case of math, they aimed to teach "... a math that the pupils cannot apply to life situations when they get out of school." Well, they sure did that to me! And millions of other suckers. And it's all mandatory wasted time and effort. And the worst part of it is that our schools are still doing this to our children.

Flu Shots

For those of you who still believe in doctors and dutifully go to get your flu shots, I'm sure you haven't read what Dr. Hugh Fudenberg, the world's leading immunologist (850 papers published in peer-reviewed journals), has said about them. He's found that anyone who had five flu shots between 1970 and 1980 had a ten times higher chance of Alzheimer's than if they had one or none. How come? He attributes it to the mercury and aluminum that's in every flu shot, which quickly migrates to the brain.

This, of course, suggests that the use of amalgam fillings in teeth as a possible leading contributor to Alzheimer's. Mercury is severely toxic, and it's gradually released from your teeth into your body. Visit a nursing home some time and see what it's like for old people to turn to veggies, tied to their chairs. My mother went that route, so I know the full horror. Well, she had no way of knowing this could happen, since that was before I started researching the situation.

Dr. Page

An ex-employee of mine, who died last year of fatness, swiped my treasured 1949 copy of Dr. Page's *Degeneration*—>Regeneration, so I was delighted to come across his

Your Body Is Your Best Doctor, This 1991 reprint of Page's 1972 book [Keats Publishing, Box 876, New Canaan CT 06840 (0-87983-540-0)] runs 236 pages, and costs only \$6. Get it. Page, a dentist, noticed that one of the early signs of degeneration of our bodies was dental cavities. That's a sure sign that you're eating wrong—wrong as far as your body is concerned, though probably "right" as far as the food experts on TV, radio, and in magazines are concerned. Plus around 95% of the stuff in our supermarkets. We're digging our early graves with our teeth - at least until we lose them. Page echoes with his research what Dr. Henry Bieler (Food Is Your Best Medicine) discovered. And Dr. Weston Price (Nutrition and Physical Degeneration). If you can read the Page, Bieler, and Price books and not make a major change in your diet, you are either monumentally stupid (like smokers), or seriously addicted to sugar. These all confirm what I've been preaching in my editorials and are the basis for my Secret Guide to Health. Through over 99% of our development over the last 3 to 4 million years, humans ate raw food. Our systems haven't yet adapted to cooked food, refined sugar and flour, hydrogenated fats, and so on. These things are slowly killing us.

Continued on page 61

VHF and Above Operation

C. L. Houghton WB6IGP San Diego Microwave Group 6345 Badger Lake Ave. San Diego CA 92119 [clhough@pacbell.net]

A Safe LED Optical Transceiver System

What? An LED in a transceiver system? LEDs are used in many different devices for lots of communications uses, right on down to our couch potatoes' TV remote controls. While we cannot see the IR light from LED-type remotes, it is there nonetheless, communicating with our TV set to effect changes for us.

Many at this point would wonder why we would use a visible red LED (660 Nm) for a transmitter light source when much higher power lasers are available, and are much more concentrated in their beamwidth, making long communications paths possible. I do not disagree with this point, that lasers are much better at making a long range system possible. However, there are many other considerations that need to be addressed to properly evaluate the merits of each system.

One very important consideration, when using high power lasers, is to be very careful not to point them at anyone, as this could

cause eye damage. In many communities, there are laws on the books to bring legal action where lasers have been pointed at aircraft, presenting great harm to the pilot. Be it a rotary-winged (helo) or conventional aircraft, a laser can momentarily blind a pilot. Extend this scenario to homeowners, as most of us use hilltops to make microwave and light system communications possible. Take, for instance, the prealignment of a laser system — you could just drop the laser beam into someone's home while trying to align on a remote hilltop.

The problem with lasers is they concentrate a great deal of light energy into a very

small beam, and as such have quite a small spot emanating from the laser. In most cases, this angular beamwidth of light is on the order of a couple of milliradians. That's the equivalent to a spot of 5 feet at 2 miles distance for the laser beam. In other words, a fly speck as compared to a compass degree. A laser's light beam is a very concentrated and high intensity point of light. LEDs, on the other hand, for comparison, have quite a wide beamwidth of quite a few degrees, say, 10 to 15 degrees.

The safety angle here is that lasers could work against you, as their very tight beamwidth makes them harder to aim than a microwave dish. If you inadvertently hit something and cause damage, you could have a problem with the law. With the aiming difficulty and safety issues paramount in our minds, Kerry N6IZW came up with the idea of the LED transceiver system, for several reasons in addition to the safety issues above.

Lasers are difficult to aim and require a mount much more sturdy than conventional microwave tripods. If you have such a mount for laser use, it probably has micro positioners or axis positioners like micrometer heads to provide fractional degree changes in the aiming of the laser beam. Mounts suitable for laser use would weigh in at many times the weight of a conventional microwave tripod system. And don't forget to add in the additional support equipment, like the high voltage power supply for the laser, making the system package large and cumbersome.

Does an LED system work? You bet it does! We tried out the system full duplex over a 2.2-mile path, and had 14 dB of signal margin on the 2.2-mile path, according to calculations. Did I get your attention (duplex!)?

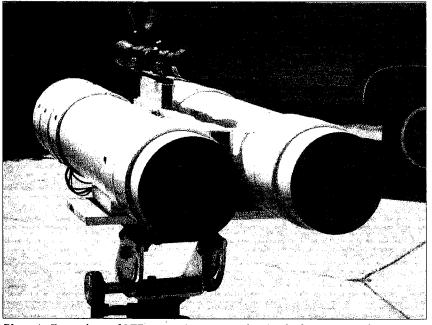


Photo A. Front photo of LED transceiver system showing both receiver and transmitter lens systems on 4-inch PVC pipe, using end caps and a splice union for 4-inch pipe to hold lens in place.

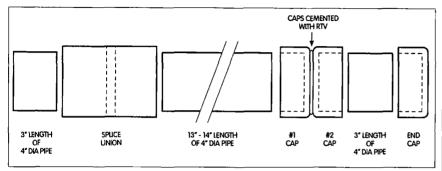


Fig. 1. Diagram of plastic pipe construction using splice unions and end caps and the method of assembling them into an optical receiver and transmitter. The 3-inch sections of pipe at the front and rear are used to fix a rear cover cap to protect the electronics, and for a dust cap to keep the lens clean when the system is in storage. Cap #1 holds LED or photo detector centered in Cap aligned with Fresnel lens. Cap #2 hold electronics for either receiver or transmitter circuitry.

Yes, I meant full communications duplex (sort of) using two similar transceivers that consist of, for each system, a single LED for the transmitting light source and a large aperture (1/4-inch) surplus photo diode for the light receiver.

Fresnel lenses focus the transmit light and received light from and to the optical devices. As for safety concerns, while the LED is a high intensity bright light, it is not anything like the intensity of a laser. However, I find looking at my 3-cell mag flashlight more uncomfortable than the LED. I don't recommend looking at any high intensity light source but if it hits you directly, it is not lethal. Had it been a laser, the story would have been different. The LED system, even if pointed accidentally at a remote object that views it from quite a distance, looks much like a large red stop light, be it a few hundred feet or 2 miles.

Amplification and large aperture optical lenses go hand-in-hand, and were used here. The Fresnel lens in question was obtained at a stationery store for \$3, and is called a sheet magnifier. These sheet-sized acrylic

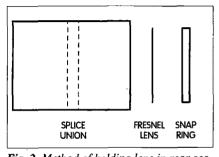


Fig. 2. Method of holding lens in rear section of splice union, using a 1/4-inch short section of 4-inch pipe as a "snap ring" to hold the rear of the Fresnel lens in place firmly against the center rib inside the splice union.

Fresnel lenses are used to magnify book or newspaper pages for reading aids. They come in a variety of sizes, with the most common being 8-1/2 by 10 inches. The focal lengths of the Fresnel lenses tried were very close to 12 inches. You can test them with a point light source and focus for best sharpness of the magnified image on a piece of paper, and then measure the separation from the lens to paper for focal length determination.

Now comes another beautiful part of this project: What to mount the LED and detector and lens into to make a hardened package easy to set up and transport. We wanted something inexpensive, and 4-inch plastic drainpipe looked just right. The pipe came with a black plastic interior and white outer covering of plastic. Just right for light reflections, with the black nearly eliminating reflections inside the pipe.

Accessory fittings made for the drainpipe made life quite easy. To make one system, eight pipe caps and two 4-inch splice unions are required, in addition, of course, to a length of 4-inch PVC plastic pipe. We obtained ours at our local Home Depot hardware store.

Let's get into the system description of the electronics side of things that control and receive the light from the LED transmitter. Development of this was the idea of Kerry N6IZW. The LED used is a common high intensity red visible LED obtained from Radio Shack for about \$2. The control circuit consists of a common CMOS 4046 PLL chip, using only the VCO portion of the chip. What makes this circuit unique is the modulation technique used. It's a single-stage electret mic amplifier using an LM-324 op amp and coupling audio through a 0.1 coupling capacitor and series 10 k resistor to the VCO control pin #9 on the 4046 PLL chip.

The output of the VCO is set at 35 kHz

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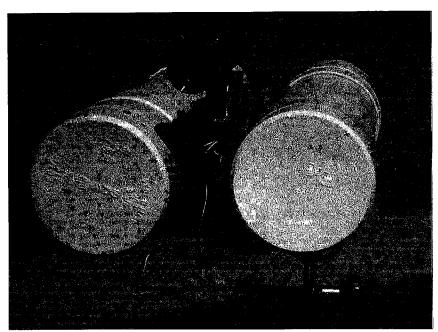


Photo B. Rear photo of LED transceiver with pipe caps in place on rear of system. More detail of aluminum rectangular tubing and "U" brackets to side of main support for "U" bracket holding 4-inch pipes in place. Additional rectangular aluminum tube attaches rifle scope on top of main support aluminum. All mounted on heavy plate for tripod mounting.

and drives an IRFZ44 power FET used as a switch to turn on and off the LED at the 35 kHz rate. Superimposed on the 35 kHz carrier is the audio FM modulating the VCO control voltage. This produces great-sounding FM audio of about 5 kHz deviation impressed on the LED, light modulation with such a simple scheme.

The detector is also quite simple. It consists of a surplus photo diode and amplifier stage that came from an IR light detector. This photo diode came as a complete assembly with a 4-stage transistor amplifier. In the surplus bin, we found several modules that use large aperture (1/4-inch) photo diodes with clear molded optics over the active area of the photo diode. Several others were dark red and only functioned with IR light sources. This IR detector can be removed and replaced with a non-IR photo diode. In both cases, the IR unit and the visible photo device conversions to the circuitry had to be made. They needed to be converted on the transistor output stage from digital output to linear, by adding one resistor and a .001 µF capacitor.

This detector is just a large aperture (surface diode detection area for light) of about 1/4 inch of active surface. The photo diodes amplifier (4-stage transistor amplifier) is used to drive the RF port of an SBL-1 diode mixer. (Remember, the transmitter LED is being modulated at a 35 or 45 kHz frequency rate, turning on and off the LED controlled via an IRFZ44 FET.)

The 35 kHz received carrier and FM modulation is applied to the RF port of the mixer, and a local oscillator is used to convert to a convenient frequency for reception of the FM modulation. The decision here was not to build a 35 kHz receiver; instead, we opted for a simpler approach. We used 145 MHz for the local oscillator injection to the mixer. The LO we used was a synthesizer, as surplus material was on hand to convert to a frequency to mix the 35 kHz to our 2 meter HT.

We set the synthesizer up for an LO of 145 MHz, allowing a 2 meter HT to be set to 145.035 MHz for the receiver portion of the system. We are looking at replacing this synthesizer with a simpler LO using a TTL crystal oscillator at 78 MHz (because it was in the junk box). The thought is that the mixer driven by 78 MHz hard will produce harmonics of 78 MHz, and using the second harmonic 156 MHz as the LO frequency will allow using a wide coverage receiver at 156.035 MHz, replacing the 2 meter HT.

We think this is a viable alternative and are experimenting with it at present. Besides, we have lots of TTL oscillators at 78 MHz and can supply them for postage costs if you don't have an alternative frequency oscillator. The exact frequency of this LO is not critical. Any frequency is usable as long as it hits an FM frequency that you and your partner agree upon. If you have an FM receiver of narrow band (5 kHz) bandwidth

in the VHF range, it will function by juggling the LO frequency that you might have on hand. Our solution is not the only one — many others are possible — this is just a guide from the parts we had at the time.

Why use 35 kHz for the LED? Well, experimentation using workbench signal generators showed that the LED efficiency dropped markedly near the 60 kHz operation test frequency. The 35 and 45 kHz operation frequencies seem to be a good tradeoff for best efficiency and operation in general along with the superimposed mic audio, 5 kHz deviation FM modulation.

We went overboard and used a 145 MHz synthesizer, because we had a few on hand, and we were able to convert them to a desired frequency on the 2 meter ham band for use with our 2 meter HTs. These synths were from surplus material and in low quantity, making other arrangements necessary such as the TTL 78 MHz system. At worst, we will need to build an MMIC amplifier doubler to 156 MHz and then use this signal to inject into the mixer LO port. In our system with the synthesizer, the 145 MHz oscillator provided our LO input to the mixer port. The IF port was tied directly to a 2 meter HT tuned to the LO plus our transmitting light frequency of 35 kHz or 145.035 MHz to receive the narrowband FM-modulated LED (35 kHz).

Why reinvent the wheel, when the HT can be used, making circuitry less complex in the construction and application of this LED transceiver. Besides, using the 2 meter HT eliminates audio amplification RF receivers and S-meter construction, as it is all incorporated in a finished, packaged 2 meter HT. (Just don't push the PTT switch on the HT — it's not needed!) That's another good point for off-ham-band frequencies such as 156 MHz, as the newer radios will receive this frequency on full coverage receivers, but will not transmit, so some protection is built in here for accidentally keying the transmitter.

Another catch concerning two stations so constructed: To prevent direct interference when both stations are closed for testing, the PLL frequency is offset 10 kHz. One station is set to 35 kHz and the other end is set to 45 kHz. In that way, the HT frequency needed at each end of the circuit is also 10 kHz apart, being in this case 145.035 and 145.045 MHz.

You can look at the optical scenario as one LED transmitter pointing at the remote receiver as path one, and the remote transmitter pointing at the other receiver. That's why it's not full duplex operation, as the Mobile, Portable and Emergency Operation

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Welcome to APRS

With all the buzz about license restructuring, one of the hot topics for discussion has been the change in the Morse Code requirements. While ham radio was once totally dependent upon Morse code, today there are dozens of ways by which we can communicate with one another. Even more important is the fact that new modes and modalities appear on a regular basis. One of the most exciting of these is the Automatic Packet/Position Reporting System (APRS). Imagine sitting in front of your computer and seeing displayed on a map where every ham station you receive is located. And the good news is that you may already have almost everything needed to put an APRS station on the air!

PRS was originally developed in 1992 Aby Bob Bruninga WB4APR. With a background as a naval officer with expertise in tactical planning and execution, Bob realized that knowing where a particular station or event was located was just as important as the information it was sending. APRS incorporates the location of any station into its message format. In fact, most APRS stations periodically report their position even when no other message is to be transmitted. As hams, we always have placed a high priority on location, whether it was DX chasing or county hunting. We usually exchange information on our city, and may even include map coordinates in the form of grid squares.

APRS stations are far more precise, and indicate their location in terms of latitude and longitude, which only needs to be entered once for a fixed station. On the other hand, a mobile APRS station can utilize the Global Positioning Satellite (GPS) system to determine precise location coordinates and then update its location to other stations each time it transmits. This means that you can watch the track of a mobile station on the map display as the station travels. Cars, trucks, boats, planes, balloons, and even satellites are common APRS objects.

APRS stations may be connected to sensing devices so that weather data can be displayed, which may include temperature, barometric pressure, rainfall, and wind speed and direction. There is even the ability to display objects on the APRS display that are not stations. The current location of a hurricane or wildfire may be very significant during disaster communications. On

the other hand, when hams are assisting in a public service event, displaying the location of a visiting dignitary or the lead runner in a marathon provides better information than periodically getting verbal updates.

Like packet, most of the activity takes place on two meters, although, also like packet, there are HF operations as well. The main difference between packet and APRS is the software that you'll be running to operate the station and the manner in which you communicate. While packet was generally text-driven and seemed to revolve around packet bulletin boards, APRS is far more graphical in nature. The most popular APRS software is available for download on the Web for DOS, Windows, Macintosh, LINUX, and various hand-held systems such as the Palm Pilot.

So, what does it take to get into APRS? If you are a fan of recycling, APRS provides an excellent opportunity. Not only can you use that old TNC gathering dust in the closet, but this may provide a new life for your old brick-sized 2 meter HT you stopped using 3 years ago. Have your kids taken over your Pentium III computer for playing games? You can just drag in that old 386 computer from the garage — it will work fine for APRS. Congratulations! You now have the hardware you need to get started! Don't have Windows 95 or 98 on the old computer? The DOS version of APRS will surprise you with its capabilities. The 2-meter rig you are planning on using is only a watt and a half? APRS uses a relay system in which this should work just fine.

Connecting everything together is relatively easy. Obviously the radio needs to be connected to a power supply and an antenna. If you are using an old handie-talkie, the drop-in charger and rubber duck may be all you need. If you opt for an external antenna, a simple (and inexpensive) quarter wave will be all that you need unless you are located in some very remote and isolated area. The computer will be connected to the TNC through a serial cable. These are frequently DB-9 connections, so the cable is available at any computer store and most electronics stores, such as Radio Shack.

The cable that connects the TNC to the radio may require a little assembly. Usually you can find the requirements in the manual for the TNC, but essentially they will include the following. A cable from the external speaker or earphone jack on the radio to the data in connector on the TNC. A connection from the data out on the TNC to the microphone socket on the radio, and finally a cable to activate the push-to-talk on the radio. My MFJ TNC uses a DIN-type plug, so I found a cable originally intended for a game controller, cut the one end off, and added the connectors for the radio to that end. This cable should provide no major challenges, but if it does, odds are that you can find a fellow ham in the area who can provide some advice. You can also check out a Web site such as the one operated by the Tucson Amateur Packet Radio (TAPR) group [http://www.tapr.org]. There are discussion groups and even lists of hams who

Continued on page 58

ON THE GO

continued from page 57

are willing to be a resource for new entrants into the APRS arena.

Speaking of the TAPR Web site, you'll be stopping there anyway to download the software that will make everything work. Choose the APRS section, then find the operating system your computer uses. There are zip files that contain the entire program as well as updates from one version to newer versions. The file names are usually pretty self-explanatory. If there are numbers in the file name, they often refer to the version number, so between the number in the title and the date listed next to it, you should be able to determine which is the most recent offering. If it is a zip file, you will need to expand the program to its regular size by using a program such as WinZIP. This is a shareware program that can also be obtained on the Web. Once expanded, the program will have all the necessary directories, folders. and files, including a selection of maps.

A word about shareware. Shareware is a means for distributing software to make it easily accessible. Why drive to the computer store when you can purchase a program online? With shareware, you have the opportunity to obtain the software and try it out, with the expectation that if you continue to use it, you will send the author payment and register your copy. Usually the price is very reasonable, and happy authors tend to write more and better software!

The shareware versions of most of the APRS programs allow you to use all the functions of the program, but do not save the settings from one session to the next, Until you register the program, you'll have to enter your call-sign, location, and all your preferences (one of the practical good reasons to register your software). You can determine your location in one of several ways. Obviously, a detailed map with latitude and longitude is helpful, but most versions of the APRS programs allow you to determine map coordinates by using the mouse to point to your location on the map. You can also check various Web sites such as [http:// www.QRZ.com], enter your own callsign, and then ask for more details. You will see information that includes your address, grid square, and latitude and longitude.

Tune your radio to the APRS frequency (144.390 MHz simplex for 2 meters). You should soon see stations begin to appear on your map. You'll be amazed at all the features the software offers, but fortunately it is very intuitive and fun to explore. Give it a try, and let me know what you think! See you on APRS!

Ah, the Technomadic Life! continued from page 17

that first sparked your interest in electronics, radio, and computers. I see it slipping away all around me, as incredible technology becomes taken for granted and relegated to the dusty corners of a busy life. Embrace it. Take it to extremes. Imagine the wildest application possible for your gadgets of choice and then make it happen! It's astonishing what you can accomplish if you just start dreaming and building ... one step at a time.

73 from the Microship ... see you out there!

Well, Not Exactly continued from page 30

Problems arise when unwanted currents flow through the probe cable shield impedance. Fig. 2(b) illustrates one way that this can happen. Typically, the scope and power supply of the unit under test are connected to the same "U" grounding 115 VAC outlet. The safety ground leads now form a loop with the probe cable resistance in series. This loop (let's call this the DC loop), being in the presence of magnetic fields, causes current through the cable shield resistance and results in voltage drop E2. This, being in series with source voltage El, is presented to the scope input. This results in the condition shown in **Photo C**. The 60 hertz wave shown is caused by 84 milliamperes AC rms flowing in the probe cable shield. Another parallel loop exists (call this the AC loop), in which the cable shield is also a common impedance. It is formed by the 115 VAC power leads supplying the scope and UUT. It differs slightly from the DC loop in that there is no DC path inside the scope and UUT. However, considerable capacity exists between the input and output of their respective power supplies, which completes the AC loop.

Trying to rid yourself of an unwanted signal may or may not be easy. Here are some suggestions. For 60 hertz signals, providing another low impedance ground path between the scope and

UUT chassis may help. Breaking the DC loop will work, but may compromise the safety ground feature and this is not recommended. Higher frequency unwanted signals (transients, such as generated by a switching-type power supply) getting into the AC loop are considerably harder to eliminate. A low resistance additional ground path between units may still exhibit considerable RF reactance and not be effective. Placing ferrite cores (of the type used for TVI reduction) on the power cords of both units may help. If the scope has dual inputs, it may be possible to cancel out a large portion of the unwanted signal by using the B input. Connect the B probe ground clip and tip to the same point as the A probe ground clip. Set the scope control to subtract trace B from trace A. and adjust the attenuator of trace B for best cancellation.

Perhaps the low-priced scope we own may not exactly be perfection, but it is quite capable of providing much information and can be very useful if we keep in mind what may be happening. I hope this article will be of some use to you. Take it from me — even the poorest scope beats a 1,000 ohms/volt multimeter for troubleshooting.

Exploring the Kenwood TM-D700A continued from page 41

locations you've identified to the system. Most GPS receivers use a standard four-pin connector that has a lead for power, ground, and data in as well as data out. The Kenwood TM-D700A comes with a cable that allows the signal to be accessed by the radio. Add the proper connector for the GPS receiver and plug it in. When the radio detects that it has received a valid GPS position, it can broadcast a beacon announcing your position. Don't want everybody to know exactly where you are? You can introduce a variance which will still provide a relative position but at less than pinpoint accuracy.

As you receive other stations, the TM-D700A will display the station ID. If it is a new station it will also display its status text. You can toggle the

screen so that it will list the last 50 stations you have received. If you wish to send a message to one of the stations, you can select it from the list and enter a message from the control panel. You can select upper and lower case, as well as numerals and various characters by using the tuning knob and two of the buttons. You can also use the keypad to directly enter text. Since the keypad buttons are programmable, you have additional flexibility in setting it up the way in which it feels most comfortable to you. These two methods may not be the same as touch typing, but they are more than adequate for short communications without having to add/plug-in/switch on any other equipment.

While receiving other stations, you can display the details of that station, which usually include city, state, transmitter power, antenna height, and location. If the TM-D700A knows your current location, it will display the direction and distance from your current location to that particular station. I have mine set so that it shares the location information on other stations with my GPS in both directions. This means that the GPS unit then gives me a map of the area showing where the other APRS stations are located. While this is a lot of fun, needless to say it could be of great benefit when supporting a special event or emergency. Want to find KE8YN? He's 3.2 miles on a heading of 231 degrees from your current location. Are the roads inaccessible? Don't worry. If you have to go off the beaten path, the GPS will turn you back to the correct direction.

I have mine set so that it automatically answers for any message sent to me. The automatic response requests that they indicate a frequency for voice communications if the other station wishes to have a QSO. I get a beep when I receive a message and a quick glance at the screen will tell me what frequency they wish to use. The TM-D700A allows me to talk on 2 meters (or 440 MHz) while the APRS continues to operate on the other band. Of course if you notice me on your display from a greater distance you can enter a 20-meter frequency as well. With the

relay capability of APRS, it is very possible to have a station display that is not in the immediate area, so HF might be the band of choice.

So there you have it. A rig for all seasons and with capabilities that you will grow into, not out of. Would I recommend this rig to a friend? Absolutely, and without a moment's hesitation! If I were buying a new rig, this would definitely be the one I'd get. I guess that says it all.

THE DX FORUM

continued from page 45

major historical areas. In exchange, a certificate will be issued in the name of the amateur that contributed the fee. Special certificates are also available for 10 trees or more.

As for log submission, all logs must include callsign, RST reports, date, time (UTC), and major historical area. Also all calculations for credit must be clearly specified. The operator's callsign, name, country/state, address/mail address and zip code must be clear on the log form. No QSLs are required (yippee!). All logs must be submitted before March 3, 2001, and may be sent to the award manager either via bureau or via home address: Yoram Gottesman 4Z1GY, 1 Kehilat Jitomir St., Neot Afeka, Tel Aviv 69410, Israel, or to: [high_test@ibm.net].

Pulling the big switch

So much for this month's offering. I look forward to hearing from all of you very soon, so ...

73 and good DX!!

THE DIGITAL PORT

continued from page 50

doctors this last month. I had quintuple heart bypass surgery. That seems to put me right in the mainstream of "must-do" events. Since this was the same description given to David Letterman's bout with the medical folks, I asked, "Is this going to make me rich and famous?" There wasn't even a hint of encouragement there. Doctors are sometimes overly serious about their work.

They seem to have done a good job. I don't see any complications. It did cut back on some of my experimenting time, but I got a bit of operating time in instead. I will

try to be more enlightening for you when next month rolls around.

If you have questions or comments about this column, E-mail me at [jheller@sierra.net]. I will gladly share what I know or find a resource for you. For now, 73, Jack KB7NO.

ABODE HND BEYOND

continued from page 56

frequency is split, but as far as I look at it this is a full duplex system. In operation, full duplex audio is present to the listener at either end of the path. In the 2.2 mile contact Kerry N6IZW and I made, communication was as good as AFC locked 10 GHz Macom Gunnplexers.

The optical path has some parallax which can be minimized with little effort. The real path is like looking at both ends of the circuit as being binoculars looking at each other. One side of the binocular is the transmitter and the other is the receiver. Maximum light detection system amplification is aided by the 4-inch diameter Fresnel lens over the Tx LED and Rx photo diode.

Getting to the optics and plastic pipe construction is not difficult at all. Sections of 4-inch pipe are cut to a length of between 13 and 14 inches to allow movement for final focus of the electronics and lens positioning. Plastic pipe caps are used to hold a small PC board with slots cut for mounting 6/32 nuts and bolts. This allows the electronics to be centered in the pipe cap. Final positioning of the LED and photo diode will be centered in the Fresnel lens pipe system. Three pipe caps form the rear housing, with two caps RTV-cemented back to back. One cap slides over the 4-inch tube at the rear of the device, holding either the LED or photo diode. The remainder of the electronics are contained in the second rear-facing pipe cap. This allows simple servicing without disturbing the position of the optical components once aligned.

To close off this opening after installation and check it out, a 3-inch section of 4-inch plastic pipe is inserted in the rear pipe cap and another pipe cap is pushed over the protruding short section of pipe. This closes off the container at the rear and provides protection for the electronics. A hole is drilled in the pipe cap for DC power and IF coax to leave the assembly. A notch is cut in the 3-inch pipe section to allow for the pipe to slide over the cable exit hole.

Continued on page 61

Jim Gray W1XU/7 210 E Chateau Payson AZ 85541 [jimpeg@cybertrails.com]

Ionization and You

You can see from the calendar that the days June 1–8 and 23–27 are expected to provide seasonably good DX signal propagation above 20 meters, but not be as good as HF propagation in March and April.

The days from June 9–13, 18–20, and on the 30th, are expected to exhibit ionosphere disturbances — some severe — accompanied by Poor and Very Poor propagation on 30, 40, and 80 meters, due to excessive signal absorption and noise from an upset-to-active magnetic field.

Contrarily and occasionally surprisingly, propagation on the 20 through 10 meter bands could be quite good during this disturbed period, particularly on paths across

the equator. Polar paths, however, are likely to exhibit auroral echo on most signals. Frequently, some of the best times for excellent DX propagation occur on the days following recovery of the ionosphere from disturbances (P-F and F on the calendar).

VHF and UHF openings may often occur during ionospheric disturbances which result from Earth's upset to active magnetic field.

Please note that the Band-Time-Country chart shows the MUF (maximum usable)

15/17

10/12

10/12

20

15/17 15/17

20 10/12 10/12 20

15/17

20

bands, so you may wish to try the next *lower* band at the times shown.

As always, carefully monitor WWV at 18 minutes after each hour for the "Solar Terrestrial Indices," which give the state of the Sun, the Earth's magnetic field, and the ionosphere.

Do you ever wonder why signals on many DX bands are better at your location during late afternoon or early morning hours, and poorer during the middle of the day? The condition is related to the amount of ionization of the upper atmosphere caused by ultraviolet radiation from the Sun. Too much ionization when the Sun is directly overhead causes signal absorption rather than refraction/reflection, but when the sunlight grazes the upper atmosphere at shallower (less than direct) angles during morning and afternoon hours, there is a time when ionization is at its most effective level for refracting HF signals.

You may have noticed that above 30 meters, the best DX occurs during early morning and late afternoon hours, and on bands below 30 meters, daytime ionization is usually too intense, and signal absorption is too great, for effective propagation. However, these lower frequency bands begin to recover after sunset and usually provide their best DX propagation during night-time hours.

Gray-line propagation occurs along a sunset/sunrise path about an hour before dark, and after sunrise, and offers excellent propagation to many parts of the world at these times.

Band-by-band summary

10 and 12 meters

Good daytime DX on transequatorial paths to North and South America, Africa, and the Pacific, is expected on (G)ood days, with signals peaking in strength during the local afternoon. Plenty of short skip to 1500 miles or more should occur on (G)ood days.

15 and 17 meters

Good daytime DX to many parts of the world, with maximum signal strength occurring during the late afternoon hours. These bands usually close after dark, Daytime short skip is expected to 2,300 miles and beyond on (G)ood days.

20 meters

Good DX conditions both day and night, with best signal strengths occurring after sunrise and again in the late afternoon and

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA					l		17/20	15/17	15/17			
AUSTRALIA	12/15	12/15			12/15	20/40	12/15	20				
CENTRAL AM.	15/17	15/17	15/17	40	40		20	20			10/12	10/12
EUROPE		30/40	30/40					12/15	12/15	20/15	12/15	12/15
FAR EAST						20	15/17	20			i	
HAWAII	12/15	12/15	20/17	20/17	20/17		20					
INDIA	20				20	20						15/20
MID-EAST	20	20/40	20/40							12/15	12/15	12/15
RUSSIA/C.I.S.	17/20	17/20	17/20									17/20
S.E. ASIA	15/17	17/20										
SOUTH AFRICA		40/30		17/20				12/15	12/15			
SOUTH AM.	15	15	20	20							10/12	10/12
WEST COAST	15/17	20	20	30/40	30/40	30/40	30/40		10/12	10/12		15/17
		CE	NTR	AL U	NITE	D ST	ATES	TO:				
ALASKA	15/17	17/20	17/20			30/40	17/20	17/20				
AUSTRALIA	15/17	15/17	17/20	17/20	20		20	20				
CENTRAL AM.	15/17	17/20	17/20	17/20	17/20		17/20	17/20	15/17	10/12	10/12	10/12
EUROPE	17/20	17/20	17/20					Ĭ				17/20
FAR EAST	15/17	17/20	17/20			30/40	17/20	17/20				
HAWAII	15/17	15/17	15/17	20	20/30	30/40	${}^{-}$	17/20				
INDIA	15/17	20	1				20					15/17

EASTERN UNITED STATES TO:

WESTERN UNITED STATES TO: ALASKA 20 20 30/40 15/17 AUSTRALIA 10/12 15/17 15/17 20 20 20/30 30/40 CENTRAL AM. 15/17 20/30 20/30 20/30 30/40 10/12 15/17 10/12 EUROPE 20 15/17 15/17 20 20 FAR EAST 15/17 20 20 30/40 10/12 20 15/17 HAWAII 10/12 17/20 20 30/40 30/40 30/40 20 20 15/17 15/17 15/17 INDIA 15/17 15/17 20 MID-EAST 20 20 15/17 RUSSIA/C.I.S. 20 20 20 20 20

SOUTH AM. 15/17 15/17 20 20 20/30 EAST COAST 10/12 10/12 15/17 20/30 30/40 60 73 Amateur Radio Today • June 2000

20 20

17/20 17/20

15/17

10/12

20

20 20

17/20 17/20 17/20 17/20

10/12 15/17 30/40 30/40

MID-EAST

S.E. ASIA

S.E. ASIA

SOUTH AFRICA

RUSSIA/C.I.S.

SOUTH AFRICA

SOUTH AM.

June 2000						
SUN	MON	TUE	WED	THU	FRI	SAT
				1 G	2 G	3 G
4 G	5 G	6 G	7 G	8 G-F	9 F-P	10 P
11 P	12 P-VP	13 VP-P	14 P-F	15 F-P	16 P-F	17 F-P
18 P-VP	19 VP-P	20 P	21 P-F	22 F-G	23 G	24 G
25 G	26 G	27 G	28 G-F	29 F-P	30 P	

evening hours. You can also expect to hear strong signals in the west, northwest, and Pacific areas during hours of darkness. Daytime short skip beyond 2,000 miles is anticipated on most days.

30 and 40 meters

Good DX to most parts of the world from our location is likely during night-time

hours, beginning at sunset and extending after sunrise. High static levels due to occasional thunderstorms along the path of propagation may be expected. Short skip between 500 and 1,000 miles can be expected on most days.

80 and 160 meters

Some weak DX openings may occur during darkness hours and around sunrise, but will often be masked by high noise levels due to thunderstorm static. Night-time skip between 200 and 2,000 miles may be expected, but daytime skip will be limited to about 200 miles. 73, W1XU/7.

ABOVE AND BEYOND

continued from page 59

The front lens, for both transmitter and receiver, is made by carefully cutting out an exact-diameter lens centered on the circular pattern of the Fresnel lens material, cut to the same diameter as the outside of your 4-inch pipe. Be careful here, as the inner dimension of the pipe is 4 inches, the outside is slightly larger. You want the lens to be the exact size as the outer pipe dimension, as a 1/4-section (snap ring) of pipe will hold the lens in this splice union assembly for the soft acrylic lens.

A pipe union or splice for 4-inch pipe has a rib of plastic about 1/8-inch square centered inside the length of the splice union. This centrally located rib is used to hold the front of the lens internally in this union. A section of 4-inch pipe about 1/4-inch wide is then inserted into the splice union and pushed up to hold the rear of the lens firmly in place against the centrally located rib section. Essentially, the lens and 1/4-inch retaining ring holds and compresses the edge of the lens against the fixed rib, making a near perfect lens mount easy to construct.

After final focus with the LED transmitter and receiver optics, the outer part of the 4-inch pipe is marked where the caps and splice union should be positioned on the 4-inch main tube. Drill to hold this marked position on both the splice union and rear pipe caps and tap for 6/32 or a convenient short screw to hold these parts together firmly. Don't drill too deep and run the drill into the electronics inside the pipe caps.

Well, that's it for this month. Next time, I will get into the construction of the transmitter circuitry and details of the mount for both receiver and transmitter. See you next month, Chuck WB6IGP.

NEVER SAY DIE

continued from page 53

Dr. Bieler

Walter Chamberlin, an old buddy from my 1950 ham teletype days, stopped by with his wife Sally. Naturally our conversation got to health. I was surprised to find that Sally's father was Dr. Henry Bieler, who wrote Food Is Your Best Medicine back in 1965. The good doctor had discovered what I've discovered in my research - that all degenerative diseases are the result of poor nutrition. And that includes dental problems as well as arthritis, cancer, heart disease, Alzheimer's, Parkinson's, diabetes, and so on. The book, published by Ballantine Books, ISBN 0-345-35183-5, is \$6, 236 pages, 1992. So, if you won't take my word for the only way you are going to repair the years of damage you've done to your body through ignorance, and "doing what everyone else does," read Dr. Bieler's book and get busy rebuilding your body. Walt was kind enough to send me a copy of another Bieler book, one which is not currently in print, The Incurables. In it, he goes into detail on his treatment of youngsters with leukemia, kids the hospitals and other doctors had given up as incurable and would soon die. Step one was to stop all milk and milk products. Step two was to feed the kids pureed vegetables and either pureed raw liver or liver juice (for babies). The results were spectacular! As I've mentioned, I happen to love raw liver. Mmm, it's good! Well, as I've explained, I do cheat just a little by searing the outside of the slab of liver for about five seconds per side. However, you are probably so conditioned that you won't even be able to try it. The ugggh factor.

Hmm, how strong is your ugh factor? Would you rather die than even try liver my way? Probably. Anyway, get the book and see if you can help some friends to stop poisoning themselves, even if you are unable. Go thou and heal!

Rich Dad

Spend the sixteen bucks for *Rich Dad*, *Poor Dad*, by Robert Kiyosaki, Tech Press, 6611 N. 64th Place, Paradise Valley AZ 85253. The better book stores should have it. ISBN 096438561-9. I love it when a book comes along that backs up my attempts to deprogram your total trust in jobs — in working for a company for a living. The author of the book has a poor dad, who is a college professor and thus never has much money. His best friend's dad, the rich dad, skipped college and has his own successful business.

The book pushes investing as a way to accumulate money. I've never had much of an interest in money, so I've never paid much attention to investing. I've invested, in my own way, by starting new magazines or other projects when I had any extra money. I've invested in growth, rather than cash or stocks.

But, no matter what you do with the money you make, this book makes it very clear that the normally accepted career path via college so you can become a working stiff is a crock. That's the poor dad approach.

For instance, Lesson Six says: Work to learn, don't work for money. If you read my Secret Guide to Wealth, this is exactly what I preach. Yet, this is a totally alien concept to 99.9% of the public. I've had over a thousand employees and I can't think of more than one or two who ever made any detectable effort to use their job as a way to learn. Almost all put in the minimum hours they could get away with and spent as little effort possible.

Just as reading a health book won't get most people to change their destructive eating habits, reading this book (and mine) won't change the belief in the need for a college "education." Such religious beliefs are deeply ingrained.

Pure Water

Considering all of the toxic waste in our drinking water, plus the importance of drinking at least eight glasses a day (remember, we're about 70% water, so we need a lot of water to keep our cells healthy — indeed, one of the moves Dr. Lorraine Day made when she found she had terminal breast cancer was to drink 20 glasses of pure water a day, plus lots of carrot juice and an all-raw

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NEUER SRY DIE

continued from page 61

food diet), we need to invest around \$200 in either a reverse osmosis filter or a small still.

Well, there's a third, less expensive alternative. What you do is fill a jug with your tap water, then freeze it in your freezer for 18 hours, pour off the remaining liquid, and melt the ice. If you want to be sure to have ultra pure water, do this twice.

This is a process that can be used to desalinate sea water. Water freezes far before the impurities in it, so they stay at the bottom.

If you have fluorides or chlorine in your water you and your family are at risk. Why introduce these toxic chemicals into your body? Fluorine is one of the most corrosive elements known, just what you and your kids need to drink. It mottles the teeth and there isn't one honest study that has shown fluorides in the water to reduce tooth decay. If you think I'm wrong please read at least one of the books on the subject which I've reviewed in my Secret Guide to Wisdom.

Isolationist Hooey

Someone was nice enough to send me a video of John Coleman ranting about the loss of American jobs due to more and more of the stuff we used to make now being made in other countries. I remember Ross Perot telling us about the great sucking sound of American jobs moving to Mexico as a result of NAFTA.

Well, all these isolationists are right — millions of American jobs have been moving to lower wage countries. Gee, that's awful, isn't it? Here in New Hampshire hundreds, maybe thousands, of women who used to work on production lines in our shoe factories lost their jobs when the factories moved to China, and so on.

So, if it's so awful, how come our national unemployment is at record lows? Is everybody working for peanuts at McDonald's and Burger King? Worse, how about the millions of aliens who have come here, legally or illegally, taking away jobs from hardworking Americans? Okay, so where are the unemployment lines?

I was looking over my shirts. I have several that are so old they say "Made in USA." But my newer shirts were made in Malaysia, Indonesia, Mauritius, Pakistan, China, United Arab Emirates. Dominican Republic, Bangladesh, Taiwan, Hong Kong, South Africa, Korea, El Salvador, England, Ireland, and Japan.

With machine wash and wear winter flannel shirts (Malaysia) selling for \$10 from Haband (800-742-2263), and their "fit-forever" expandable jeans, which seem to also wear forever, at \$17.50 (United Arab Emirates), well-made clothes have never been cheaper.

Also. Americans have never been living better. Most families these days have all the usual appliances: color TVs (often in several rooms). VCR, microwave, food processor,

dishwasher, clothes washer and dryer, a personal computer or two, and so on.

When I was a kid, we had wash tubs in the basement, my mother used a washboard, and hung the clothes on the line in the back of the house. It had pulley wheels on each end so it could be loaded from the back porch. The ice man came a couple times a week. He knew how much ice to put in our ice box from the sign in the front window. The milk was delivered early every morning to the back porch. The Bohack boy delivered groceries on his bicycle which we ordered by phone. Our macaw would yell out "Bohack" when the boy appeared at the door. We washed the dishes in the kitchen sink and the dryer was one of the more modern conveniences, a wooden rack hung on the wall. There was a butter and egg man who delivered door to door, as well as a bakery

In the summer, a fellow came around with a horse-drawn wagon selling Italian ices. 2¢ and 3¢ cups. Delicious. The scissors and knife grinder man also had a horse-drawn wagon. The man buying used clothes was on foot. He walked down the middle of the street yelling, "Cash clothes." There weren't many cars in those days, so he didn't worry about getting run over. In fact, there were so few cars that we played marbles in the gutter. With cars parked solidly on every street kids can't do that any more. We also had Italians with hurdy-gurdies and a monkey to go after the pennies from his audiences down at the corner by the Chinese laundry.

Instead of making shoes and coats in New Hampshire we've got mail order companies such as Brookstone, Eastern Mountain Sports, and New England Business Services (NEBS). There's New Hampshire Ball Bearing, which makes miniature ball bearings for your disk drives, and hundreds of software companies. We've turned the old mill buildings into groups of boutiques and restaurants. PC/Mac Connection moved from an old farmhouse in Marlow NH, rebuilding a shopping mall in Amherst, where their hundreds of cars are parked seven days a week. New Hampshire has gone high-tech and, according to every national survey, has the highest quality of life of all 50 states. The air is clean. We're about 75% forested. We have no state income or sales taxes, so prices are bargains. Our White Mountains are beautiful and we have the largest citizen legislature in the country. Yet it's a state small enough so that I've known and worked with the last six governors personally.

Culture? There's a blues club a mile and a half from where I live. We've a nearby restaurant that specializes in folk and bluegrass entertainment. There are three Chinese restaurants and four supermarkets within a ten minute drive.

With today's cell phones, e-mail, voice mail, the Internet, and faxes, communications anywhere in the world has never been easier or cheaper. The personal computer has revolutionized everything, eliminating millions of semi-skilled jobs. Between jumbo jets and container ships, shipping has never been faster or cheaper.

Many worriers are bent out of shape over the idea of a world government. Well, a couple hundred years ago, 13 states got together and started the United States, and that has worked out pretty well. It's grown to 50 and if we'd relax a bit we'd see a bunch more countries delighted to join us.

Yes, I agree, we've got a lot of serious problems. It's just that, as bad as they are, the other countries are in worse shape. If we'd implement my proposals for solving the control big business and the banks have over Congress, my solution to the drug war, to our far-too-expensive health care system, to our worst-in-the-developed-world public school system, and so on, we'd be able to interest a hundred countries in joining us.

What drawback would there be if Canada added 13 more states? We might have more of a problem adjusting to 24 Mexican states. Well, at least we'd only have one Canadian state that wasn't English-speaking.

At any rate, the cry for isolationism should be ignored. It's all a bunch of hooey. Pee-rot, you're full of it.

Coffee

In my health guide, I list caffeine as an addictive poison which anyone interested in health should avoid. Sure, we're able to last 60 or 70 years, even when we poison our bodies with caffeine, nicotine, alcohol, sugar, cooked food, and so on. But the resulting quality of life sure sucks. I challenge you to find a nursing home anywhere that's feeding it's prisoners healthy food. That's as unlikely as finding any other kind of prison providing healthy food.

Coffee is so toxic that it does chromosomal damage, causing mutations. Just what parents want to do to their children, right? It has also been linked to an increased risk of stomach and bladder cancer. It contributes to diabetes. The rush of white cells to fight the caffeine depresses your immune system, making you more likely to get anything that's going around.

In animal tests those who were given coffee drank two to four times more alcohol. Yep, that morning cup of coffee you use to wake you up can help make you an alcoholic.

One of the most brilliant electronic engineers I've known was addicted to coffee. He got diabetes and it eventually killed him in his 60s.

Coffee reduces bone density for women. It reduces fertility, and it's responsible for a higher rate of miscarriages.

Oh yes, many sodas have caffeine in 'em,

Are you addicted? It's easy to find out. Just stop drinking coffee or caffeinated drinks like Coke — if you can. Good luck!

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Wise Up!

Here are some of my books which can change your life (if you'll let 'em). If the idea of being healthy, wealthy and wise interests you, start reading. Yes, you can be all that, but only when you know the secrets which I've spent a lifetime uncovering.

.....Wayne

The Bioelectrifier Handbook: This explains how to build or buy (\$155) a little electrical gadget that can help clean the blood of any virus, microbe, parasite, fungus or yeast. The process was discovered by scientists at the Albert Einstein College of Medicine, quickly patented, and hushed up. It's curing AIDS, hepatitis C, and a buncut of other serious illnesses. The circuit can be built for under \$20 from the instructions in the book. \$10 (#01)

The Secret Guide to Wisdom: This is a review of around a hundred books that will help you change your life. No. I don't sell these books. They're on a wide range of subjects and will help to make you a very interesting person. Wait'll you see some of the gems you've missed reading. \$5 (#02)

The Secret Guide to Wealth: Just as with health, you'll find that you have been brainwashed by "the system" into a pattern of life that will keep you from ever making much money and having the freedom to travel and do what you want. I explain how anyone can get a dream job with no college, no résumé, and even without any experience. I explain how you can get someone to happily pay you to learn what you need to know to start your own business. \$5 (#03)

The Secret Guide to Health: Yes, there really is a secret to regaining your health and adding 30 to 60 years of healthy living to your life. The answer is simple, but it means making some difficult lifestyle changes. Will you be skiing the slopes of Aspen with me when you're 90 or doddering around a nursing home? Or pushing up daisies? No, I'm not selling any health products. S5 (#04)

My WWII Submarine Adventures: Yes, I spent from 1943-1945 on a submarine, right in the middle of the war with Japan. We almost got sunk several times, and twice I was in the right place at the right time to save the boat. What's it really like to be depth charged? And what's the daily life aboard a submarine like? How about the Amelia Earhart inside story?If you're near Mobile, please visit the Drum. \$5 (#10)

Wayne's Caribbean Adventures: My super budget travel stories – where I

visit the hams and scuba dive most of the islands of the Caribbean. You'll love the special Liat fare which let me visit 11 countries in 21 days, diving all but one of the islands, Guadeloupe, where the hams kept me too busy with parties, \$5 (#12)

Cold Fusion Overview: This is both a brief history of cold fusion, which I predict will be one of the largest industries in the world in the 21st century, plus a simple explanation of how and why it works. This new field is going to generate a whole new bunch of billionaires, just as the personal computer industry did. \$5 (#20)

Cold Fusion Journal: They laughed when 1 predicted the PC industry growth in 1975. PCs are now the third largest industry in the world. The cold fusion ground floor is still wide open, but then that might mean giving up watching ball games. Sample: \$10 (#22). Julian Schwinger: A Nobel laureate's talk about cold fusion—confirming its validity. \$2 (#24)

Improving State Government: Here are 24 ways that state governments can cut expenses enormously, while providing far better service. I explain how any government bureau or department can be gotten to cut it's expenses by at least 50% in three years and do it cooperatively and enthusiastically. I explain how, by applying a new technology, the state can make it possible to provide all needed services without having to levy any taxes at all! Read the book, run for your legislature, and let's get busy making this country work like its founders wanted it to. Don't leave this for "someone else" to do. \$5

Mankind's Extinction Predictions: If any one of the experts who have written books predicting a soon-to-come catastrophe which will virtually wipe most of us out are right, we're in trouble. In this book I explain about the various disaster scenarios, like Nostradamus, who says the poles will soon shift (as they have several times in the past), wiping out 97% of mankind. Okay, so he's made a long string of past lucky guesses. The worst part of these predictions is the accuracy record of some of the experts. Will it be a pole shift, a new ice age, a massive solar flare, a comet or asteroid, a bioterrorist attack? I'm getting ready, how about you? \$5 (#31)

Moondoggle: After reading René's book, NASA Mooned America, I read everything I could find on our Moon landings. I watched the videos, looked carefully at the photos, read the astronaut's biographies, and talked with some of my readers who worked for NASA. This book cites 25 good reasons I believe the whole Apollo program had to have been faked. S5 (#32) Classical Music Guide: A list of 100 CDs which will provide you with an

outstanding collection of the finest classical music ever written. This is

what you need to help you reduce stress. Classical music also raises youngster's IQs, helps plants grow faster, and will make you healthier. Just wait'll you hear some of Gotschalk's fabulous music! \$5 (#33)

The Radar Coverup: Is police radar dangerous? Ross Adey K6UI, a world authority, confirms the dangers of radio and magnetic fields. \$3 (#34)

Three Gatto Talks: A prize-winning teacher explains what's wrong with American schools and why our kids are not being educated. Why are Swedish youngsters, who start school at 7 years of age, leaving our kids in the dust? Our kids are intentionally being dumbed down by our school system—the least effective and most expensive in the world. S5 (#35)

Aspartame: a.k.a. NutraSweet, the stuff in diet drinks, etc., can cause all kinds of serious health problems. Multiple sclerosis. for one. Read all about it, two pamphlets for a buck. (#38)

One Hour CW: Using this sneaky booklet even you can learn the Morse Code in one hour and pass that dumb 5wpm HF entry test. \$5 (#40)

Code Tape (T5): This tape will teach you the letters, numbers and punctuation you need to know if you are going on to learn the code at 13 or 20 wpm. \$5 (#41) Code Tape (T13): Once you know the code for the letters (#41) you can go immediately to copying 13 wpm (using my system). This should only take a couple of days. \$5 (#42)

Code Tape (T20): Or, you can start right out at 20 wpm and master it in a weekend. \$5 (#43)

Wayne Un-Dayton Talk: This is a 90minute tape of the talk I'd have given at the Dayton, if invited. \$5 (#50)

Wayne Tampa Talk: This is the talk I gave at the Tampa Global Sciences conference—where I cover amateur radio, cold fusion, health, books you should read, and so on. \$5 (#51)

\$1 Million Sales Video: The secret of how you can generate an extra million dollars in sales just by using PR. This will be one of the best investments you or your business will ever make. \$40 (#52) Reprints of My Editorials from 73. Very few things in this world are as we've been taught, and as they appear. I blow the whistle on the scams around us, such as the health care, our school system, our money, the drug war, a college education, sugar, the food giants, our unhealthy food, fluorides, EMFs, NutraSweet, etc.

1996 Editorials: 120 pages, 100 choice editorials. \$10 (#72)

1997 Editorials: 148 fun-packed pages. 216 editorials. \$10 (#74)

1998 Editorials: 168 pages that'll give you lots of controversial things to talk about on the air. \$10 (#75)

1999 Editorials: 132 pages of ideas, book reviews, health, education, and anything else I think you ought to know about. \$10 (#76)

2000 Editorials: In the works.

Silver Wire: With two 3" pieces of heavy pure silver wire + three 9V batteries you can make a thousand dollars worth of silver colloid. What do you do with it? It does what the antibiotics do, but germs can't adapt to it. Use it to get rid of germs on food, for skin fungus, warts, and even to drink, Read some books on the uses of silver colloid, it's like magic, \$15 (#80)

Wayne's Bell Saver Kit. The cable and instructions enabling you to inexpensively tape Art Bell W6OBB's nightly 5-hr radio talk show. \$5 (#83) NH Reform Party Keynote Speech. It wow'd 'em when I laid out plans for NH in 2020, with much better, yet lower cost schools, zero state taxes, far better health care, a more responsive state government, etc. \$1 (#85)

Stnff I didn't write, but you need: NASA Mooned America: René makes an air-tight case that NASA faked the Moon landings. This book will convince even you. \$25 (#90)

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The 73 Flea Market, Barter 'n' Buy, costs you peanuts (almost)— comes to 35 cents a word for individual (noncommercial!) ads and \$1.00 a word for commercial ads. Don't plan on telling a long story. Use abbreviations, cram it in. But be honest. There are plenty of hams who love to fix things, so if it doesn't work, say so.

Make your list, count the words, including your call, address and phone number. Include a check or your credit card number and expiration. If you're placing a commercial ad, include an additional phone number, separate from your ad.

This is a monthly magazine, not a daily newspaper, so figure a couple months before the action starts; then be prepared. If you get too many calls, you priced it low. If you don't get many calls, too high.

So get busy. Blow the dust off, check everything out, make sure it still works right and maybe you can help make a ham newcomer or retired old timer happy with that rig you're not using now. Or you might get busy on your computer and put together a list of small gear/parts to send to those interested?

Send your ads and payment to: 73 Magazine, Barter 'n' Buy, 70 Hancock Rd., Peterborough NH 03458 and get set for the phone calls. The deadline for the September 2000 classified ad section is July 10, 2000.

President Clinton probably doesn't have a copy of *Tormet's Electronics Bench Reference* but you should. Check it out at [www.ohio.net/~rtormet/index.htm]—over 100 pages of circuits, tables, RF design information, sources, etc. BNB530

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Techs — Only — Continue to Grow

As we enter a restructured Amateur Radio Service, it's a good time to look at some statistics. First, the good news. The number of code-free Technician-class hams being license holders continues to grow. Based on a comparison census from April of 1998, the number of No-Code Techs has increased by another 21,000. That's over 10%.

Now, the bad news. All other license classes — except the Extra — are on a rather rapid decline,

with many hams just not bothering to renew their licenses. The biggest loss is in the Novice class, where there are 11,000 fewer license holders than just two years ago.

Right now, there are about 34,323 hams in the FCC database whose licenses have expired within the past two years. Their grace period has just about run out, and there is no sign of interest in any of them renewing. In the simplest terms, when these licenses get written out of the FCC records, 5% of the currently licensed hams will be gone. Put another way,

Continued on page 6

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NEUER SAY DIE

Wayne Green W2NSD/1

w2nsd@aol.com www.waynegreen.com

Progress?

What's the opposite of progress? Congress?

Club Building

Talk about making an omelet out of broken eggs, you're going to love this story — and I have George Richardson K6HOZ of the Santa Barbara Amateur Radio Club to thank for both my recent painful experience and a great idea that is going to help you build your ham club membership.

The Santa Barbara club was celebrating their 80th year (are there any older ham clubs?), so they went berserk and sent me a ticket to come out and give a talk. I reported to Untied Airlines — no, it was United — an hour before departure time at the Manchester (NH) airport. It took almost the hour on line to get to the check-in counter, so I went from there and boarded the plane. And sat. Knowing that for some weird reason my connecting flight to Los Angeles was only 29 minutes after my scheduled arrival in Chicago, I managed a twenty point rise in blood pressure as we sat there at the Manchester terminal for a half hour. Lousy weather in Chicago.

We arrived late, so naturally my connecting flight had already left. I got on a later plane — and we sat there for eight hours before they announced that the flight was canceled. Further, they announced, all the flights the next day were fully booked. So I gave up and went back to Manchester. That's a thumbnail sketch; for the full gory details, which I think you'll enjoy, you'll have to go to my Web site, [www.waynegreen.com].

Now comes the good part.

George, possibly infected by my Never Say Die attitude, hooked up an amplifier to the telephone and I did my talk over the phone, much to the delight of the club members and their guests. It worked out great!

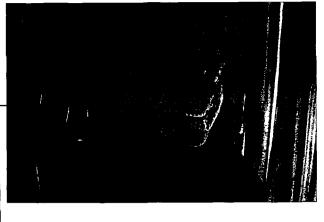
Okay, how about you hooking up a telephone to an amplifier and inviting the top ham VIPs to give a talk at your club meetings? Even the smallest ham clubs could have top name guest speakers at every meeting that way! And that'll bring new members out of the woodwork.

I'll tell you what. I'll start calling some of the experts I know and see if they're interested in such a program. Those that are I'll list, along with how to get in touch with them.

But I need your help, too. Just because someone is a name in the ham industry or an expert in some facet of the hobby doesn't mean they're going to be a great speaker, so after every guest speaker I want you to poll your club members and give me a figure on how interesting they were. from one to ten. And, as the votes come in, I'll be putting a star besides the names of the guests who get top honors as speakers.

In addition to manufacturers, some of our better known retailers. DXpeditioners. and other ham experts, we can do worse than have some other interesting guests — like some of the authors of books I've reviewed in my editorials or are reviewed in my Secret Guide to Wisdom. Club meetings could get to be a lot like mini versions of the old Art Bell W6OBB Coast-To-Coast AM radio show.

Heck, when I give talks I can talk about hamming as it was in the 1930s, when I got started — the beginnings of RTTY; how NBFM got started; why SSB edged out DSB, which was a superior technology; the day Khrushchev saved amateur radio; the greatest disaster in the history of the hobby; the excitement and adventure amateur radio has brought me; and so on.



Plus, given any opportunity, I talk about health, wealth, and wisdom — the Amelia Earhart mystery and cover-up — and so on. All those things I write about.

Would your club be interested in hearing my friend Neil Slade explain how you can make a cloud disappear just by thinking about it? Or does it have to be a ham topic? How about Jim Patterson talking about his cold fusion experiments and patents? Or Bev Jaegers explaining how you can develop your psychic ability? How about Ross Adey K6UI, the world's leading researcher in the effects of RF on our brains? Or Gordon Scallion K1BWC talking about his disaster predictions for the near future?

The Next Step

Obviously, we need to take the next step and go full video for our guests. Well, the technology is already here to do this via the Internet, so let's see some articles I can publish on how to go about doing it. Also, we need some hints on how to get the best voice quality from an amplified telephone talk. I have a high quality phone and a special low noise phone line I use for my radio talk show interviews.

With interesting guest speakers at every meeting, you'll be able to build up your club membership. When I took over the Peterborough Chamber of Commerce as president, the dull meetings had reduced the attendance to about six or seven. I invited great guest speakers and a year later we had over a hundred at every meeting. When you're the president of a club, you're in show business. Do away with those business meetings. Let an executive committee do that nonsense.

Get a phone amplifier system hooked up and get busy recruiting great speakers. Then rate 'em for me so I can get the word to other clubs.

The Pioneer

Yes, of course I'm available for talks. Get your system working, sign up on my dance card, and let me know how much time I'll have to talk and what subjects you'd prefer me to talk about. Okay, I'll put a suggested list of topics on my Web site. You can reach me via [w2nsd@aol.com], or via fax at (603) 588-3205. Please don't call—because I tend to talk too much for my (and your) good. The snail is okay, too.

Yes, of course I'll be glad to answer questions from the audience.

Dominoes

The FCC's five-words-perminute slap in the ARRL's face is echoing around the world. Britain, formerly known as Great Britain, quickly followed their lost colony's lead. Sweden and South Africa, too. And we'll soon be seeing Australia, New Zealand, Germany, Netherlands, Canada, Norway, Finland, Pakistan. India. Israel, and the rest of the world falling into line.

With the five-word-per-minute code requirement growing to be the world standard for HF ham band use, and with the use of CW continuing to fade away on our bands, there will be more and more pressure for the expansion of our phone hands.

of our phone bands.

The demand for my ridiculously overpriced \$5 One-Hour Morse Code booklet has escalated. This booklet explains how I learned the code well enough

continued from page 1

as we enter the time of a restructured United States Amateur Radio service, we are already 5% behind.

Thanks to W5Yl Report, via Newsline, Bill Pasternak WA6ITF, editor.

Storms on the Way

Ham radio operators along the eastern seaboard and the Gulf coast may want to get ready to provide a lot of emergency communications for years to come. This, as an analysis of weather patterns over the past century indicate that the increased tropical storm activity over the last five years should continue for the next two decades.

According to top hurricane forecaster William Gray, the next 15 to 20 years could resemble a siege of severe hurricanes that began in the late 1920s and lasted through the 1940s, only worse. Gray says that was a time when relatively high salt content in the Atlantic altered the circulation of ocean currents in a way that pushed up the average water temperature.

But there is a big difference between the 60 or 70 years ago and the year 2000. This is because more people now have chosen to live in harm's way. And Professor Gray cites U.S. census figures that show that the population in the Gulf and Atlantic coast states from Texas to Virginia rose from about 24 million in 1930 to about 64 million in 1990. He also notes that hurricanes draw their strength from warm water, and mixing the two factors leads to the conclusion that upcoming storms are expected to cause damage five to ten times worse than ever before in the Gulf and Atlantic coast states.

And what does this mean for radio amateurs who live in the path of these projected storms? In two words, volunteerism and preparedness.

Hams should think in terms of volunteering their time to their local ARES or some other emergency preparedness group that requires radio communications. And all hams — not just those who live where a hurricane might strike — should leam emergency communications procedures and take part in practice sessions on a regular basis.

Even with modern satellite technology and multiple redundancy in the landline and cellular telephone networks, commercial services are often the first to disappear when Mother Nature's fury strikes. It's then that ham radio operators are called on to fill in until normal communications can be restored.

Gray is a professor of meteorology at Colorado State University in Fort Collins, Colorado, and is widely viewed as the nation's top hurricane forecaster. In 1999, he predicted 14 named storms, nine of which became hurricanes. For 2000, Gray has predicted 11 named storms, including seven hurricanes. He says that three of them will be major severe weather events.

Thanks to Newsline, Bill Pasternak WA6ITF, editor.

Next Stop: White House?

The Ashland (NE) Amateur Radio Club, at its March meeting, elected a new president. What makes this a little unusual is the fact that the new club president is only 12 years old! Evan Anderson KCØCWP, a Technician, was elected club president. Evan received a two-thirds majority vote of the 17-member club.

Evan, who was born with spina bifida, received his ticket when he was only 10 years old, and is very active on 6 meters, packet, and ATV, as well as the local repeaters.

He also helps run net control on the Ashland Amateur Radio Club's 2 meter ARES weekly nets, and has run several severe weather nets.

In addition to amateur radio, Evan plays wheelchair basketball with the Nebraska Red Dawgs, who placed second in the nation at the 8th Annual Junior Wheelchair Basketball Tournament in Berkeley, California.

Evan is currently studying for his General ticket, and you should see him on the HF bands shortly. The members of the club elected Evan because of his youth and enthusiasm, and are looking forward to a fun and adventure-filled year.

WCØCWP comes from a ham-filled family. His grandfather is Marvin Anderson KAØEOE; his uncle, Dan Anderson, is KAØEOF; Dan's wife, Cristi, is KB7RAV; and Evan's proud dad is Matthew Anderson KAØBOJ.

Thanks to Newsline, Bill Pasternak WA6ITF, editor.

Alzheimer's Radio Care

Radio-locating may soon be a part of treatment to keep tabs on Alzheimer's patients. In Japan, where nearly two million elderly Japanese suffer dementia and "go walkabout," Mitsui & Co. is tracking them by satellite.

The system works a bit like the emergency positioning beacons or EPIRBS used at sea: A small transmitter is worn by the person, or attached to his or her clothing. If they go missing, family or relatives use a portable terminal to request that the transmitter be activated, and a computerized map is displayed showing the position of the missing person.

Anyone with an Alzheimer patient in their family will appreciate this latest use of radio to keep track of their loved one.

Thanks to Q-News, via Newsline, Bill Pasternak WA6ITF, editor.

You're Getting Older If You Can Remember ...

- Being sent to the drugstore to test vacuum tubes for the TV or radio.
- When Kool-Aid was the only drink for kids, other than milk and sodas.
- When boys couldn't wear anything but leather shoes to school.
- When it took five minutes for the TV to warm up and the picture to stop rolling.



Barry Hammond KE4PUD, of Roanoke VA, was first licensed at the age of nine — Tech Plus! When he was 12, he had the pleasure of operating from Australia and New Zealand. Barry enjoys paintball and soccer when he's not on the air with his 220 MHz HT. (Photo by Glenn Hammond, Sr. K4YDG)

From the Ham Shack

Gerry KC6YOO. I have enjoyed your magazine and editorials for many years. In fact, I have bought many of the 73 past issues at hamfests for the construction articles and for your editorials. Many years ago, I was introduced to ham radio by reading your magazine. It seems that ham radio was a well kept secret where I lived at the time (Los Angeles CA). Due to your editorials, I have been to introduced to colloidal silver and the work of Dr. Robert Beck. I currently use two of his devices. What I like about your editorials is that you cover ham activities and other things in a wide spectrum man does not live by radio alone! I wanted to personally thank you for your efforts over the years. I have a question that maybe you can help me with. You write of incentive licensing and the like. I have read many of the editorials and talked to many older hams. I haven't been able to get the full story. Could you tell me where I can get the information either through your articles or other reading material?

I should keep an index to my editorials. I've written in detail about the Incentive Licensing catastrophe many times, so keep checking back issues. — Wayne.

Robert J. Hajek W9QBH, Riverside IL. I looked at the cover of the March 2000 issue of 73 Magazine with nostalgia as I viewed the collection of microphones. I looked into the first few pages for a description and found that there was a full story on page 29.

As I read through the narrative, it dawned on me that the microphone information provider certainly did 73 Magazine an injustice with misinformation. It was obvious that the degree of familiarity was lacking.

I can excuse the calling the "77D" an RCA 77 microphone. But the other RCA microphone is not a 44BX but an RCA 74B "Junior Velocity" microphone. I did not need the enclosed catalog pages to determine this, as I presently own a 74B that is in better shape than the displayed unit and did in the past own a "44BX."

When I was a kid, I had an audio "broadcast station" to the neighbors. I was aware of the old restricted radiation problems of low power broadcasting, and used the microphones in addition to just being the proud owner. So I well remember using the units without the need for any auxiliary power which raises the question of being described as "condenser" mikes. No "phantom-powered external preamp" was used, just a matched impedance to an amplifier with sufficient gain. Please note that there is no reference to any supplemental power in any of the specification sheets.

The major benefit of the RCA 77D was its adjustable directional characteristics which allowed a single microphone to fit almost any application.

Sorry to rain on someone's parade, but being the packrat 1 am, I just happened to have the documentation to back up my "complaint." I depend on 73 Magazine to be more accurate. You wouldn't want me to lose faith in W2NSD, would you?

Not at all, Bob: I did win my in-house bet that you would spot those things. — Wayne.

Steven Myers WB7SON. You and your editorial column have been a source of much information, as well as inspiration. You are one of the few sources that provide information about a world that is quite different from what we are told on the boobtube and newspapers. Your ideas and information in the areas of health, nutrition, education, business, technology, and more have improved the lives of many people around the world.

Jack Sauers, Seattle WA. The Ice Age is "right on schedule," and the quasi-biennial polar oscillation cycle has shifted mostly to the east coast this winter, though last winter we set the new all-world snowfall record at Mt. Baker, going to 102 feet there, with a 15 foot holdover in September and over 25 feet of new snow or more this past fall and winter there in the Northern Cascades. However, we have set new record cold and snowfall records in Georgia and N. Carolina.

Robert Felix has my forecast times for volcanic eruptions, earthquakes, and storms on his Web site with the track record for Year 2000 thus far. That's at [http://members.aol.com/iceagenow/], and he included my latest published paper, "Global Cooling Is Underway", from 21st Century Science & Technology, Spring 1999, in the 2nd edition of his book, Not By Fire, But By Ice. The Alaska Snow Crab Commission has now postponed the snow crab season from Jan. 15 to April 1, 2000, or later, because of a big buildup of ice in the Bering Sea, and the pack ice around Antarctica has moved out from one mile to 33 miles —

that's 10 feet thick that the icebreakers going into Antarctica have to plow through now.

So far, Professor Bentley, from the Polar Research Institute at the Univ. of Wisconsin, is turning out right as Antarctica is going up at 0.2 meter/year, increasing in mass balance by 200 gigatons/year, lowering sea level by 1-2mm/year. Sea level along the Washington coast relative to the coast line is also falling from tide gauges at 102mm/year, like in Australia. My estimate is that there's a mass balance outflowage of ice in Antarctica with 1000 gigatons/year breaking off in huge masses.

Greenland is not only going up at 0.1 meter/year as Zwally from NASA had published in EOS in 1989, but his work was redone and verified, and a laser study done too, to verify that. You can see more global cooling data in the latest paper, "The Global Warming Folly," that's published in the Winter 1999/2000 issue of 21st Century Science & Technology, by a Polish scientist with 99 references. Do you know what other hardwoods have been dying back in your area like the sugar maples in Vermont, that died from the Quebec ice storm? Are the moose still migrating south?

The U.S. Weather Service now has a new climate model called the Pacific Decadal Oscillation Model, that forecasts colder and wetter times at higher latitudes for the next ten years, and drier conditions at lower latitudes like Texas and Arizona. That's in line with the now declassified USCIA models in their papers published in the book The Weather Conspiracy, the Coming of the New Ice Age, Ballantine Books, 1977. They forecast political consequences like the collapse of empires like the Soviet Union, and starvation like in N. Korea. I wrote the CIA to complain to them and also to the Center for Climatic Studies in Madison for the success of their forecasts, and have also notified the U.S. Weather Service of my forecasts.

Chris Waldrup KD4PBJ. Well, I tried out HF for the first time! Today I actually talked with three Germans, one Dutch, one Spaniard, one Czech, two Italians, one Colombian, and one ham from Washington state. With my antenna 20 feet above the ground and only 100 watts! I was shaking so much with the first QSO that I had to look up at the top of my notebook to remember my callsign. Ham radio is great! Especially 10 meters right now!

The Universal Loop

A novel, efficient, modularly constructed receiving loop antenna covering from 55 kHz to 40 MHz (or even more).

This receiving loop antenna covers a frequency range from 55 kHz-40 MHz (i.e., low LF to low VHF). It uses a range of plug-in loopsticks plus spiral and frame loops. The listening enthusiast will be able to follow the simple instructions to make a system for all-band listening or for just those portions of the spectrum of personal interest. The experimenter will be able to use the base unit as a test-bed for trying out some personal loop designs. Or, maybe, to modify and/or improve some of the ideas presented here. In such cases, much time and effort will be saved in avoiding repetitive constructional work, and trying to locate such components as suitable variable capacitors and other bits and pieces.

hile experimenting with small loop antennas for reception and transmission for many years, I have employed a simple tuning/matching unit for initial loop design work. This test-bed base was built into a well-used plastic box. The

PLI PL2

FRAME
LOOP

PLI SK1

C1A + C1B = 365 pF + 365 pF

C2 = 365 pF

Cx = see text

Fig. 1. The versatile schematic of the Universal Loop.

built-in components consisted of tuning capacitors, optional variable coupling capacitors, a coaxial socket, plus a selection of terminals connected to the various components to enable a variety of new loop configurations to be tried over a wide range of frequencies. In many cases, experimental frame loops were "lashed up," on a simple flimsy lightweight cardboard body. Thus much time and effort was saved. initially, in evaluating a new loop design concept. This established the best dimensions and number of wire turns. When a prototype was eventually made, there was a 95% chance that it would be satisfactory. Again, much time, money and frustration were saved.

The Universal Loop

Fig. 1 shows the versatile schematic of the Universal Loop, and Figs. 2(a) and 2(b) the alternative profiles using frame loop configurations and ferrite loops [2(b)].

The schematic consists of a balanced arrangement using a 2 x gang 365 + 365 pF variable capacitor (C1A and C1B), connected to binding post sockets SK1 and SK2. Alternative "plugin" ferrite and frame loops are fitted

with 4mm plug pins. Coupling to the RX input is achieved by variable capacitor C2 (365 pF) connected to the

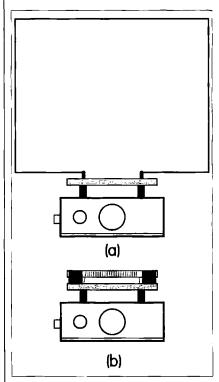


Fig. 2(a) Profile of the frame loop configuration. (b) Profile of the ferrite loop configuration.

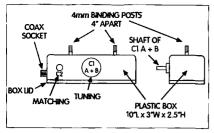


Fig. 3. The tuning/base unit.

coaxial socket. The coaxial feedline can be matched by C2 to 50-80 ohms impedance.

The tuning/base unit (Fig. 3) housing the above is built into a plastic box 10" x 3" x 2-1/2" high. For readiness of availability, at a reasonable cost, a translucent white micro-oven/fridge box is used. However, some dimensional tolerance can be allowed. C1A, CIB, and C2 are mounted on the front as shown in Fig. 3, with the socket at the end. 2 x 4mm binding posts are mounted on the top, as shown, exactly 4" apart. Binding posts are about 1" high, with a 4 mm socket in the end. There is also a side terminal connection. Tandy/Radio Shack nylon binding posts, #274-662, were used on the prototype.

In-box interconnection wiring, to Fig. 1, should be robust and securely soldered, using 18 or 16 gauge tinned copper wire. Do not rely on mechanical ioints.

Various alternative loop configurations are used (Figs. 6-10), all using a standard plug-in chassis as shown in Fig. 4. The chassis consists of a strip of rigid insulated board (up to 1/8" thick) 8" x 1-1/4" wide (Fig. 4). Two 4

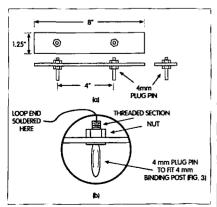


Fig. 4(a) Loop "plug-in" chassis. (b) Plug pin detail.

mm plug pins are mounted as shown, exactly 4" apart, for plugging into the binding posts on the base unit (Fig. 3).

The 4 mm pins are quite standard. with a screw thread on one end to fasten to the chassis board (Fig. 4) with nuts and washers. These pins are available from various suppliers. On the prototype, Maplin type MF72/54403/ WB43 pins were used. In the USA, Antiques Electronic Supply was advertising these in their catalog. The various loop configurations (Figs. 6-10) are mounted on these loop "plug-in" chassis.

Individual "plug-in" loop construction: the MF (MW) loop - 550-2100 kHz (see Fig. 6)

The starting point is this ferrite loop. I will also describe subsequent loops that just overlap the LF and HF ends of its range.

The unit uses a standard MW bands loopstick 5" long x 0.375" in diameter. This can be salvaged from an old radio, or can be purchased new. In this case, I used my Maplin type LB12N MW/LW ferrite loopstick. This uses a 5" long x 0.375" diameter ferrite rod. The inductance range quoted is 370 μH (MW) and 4.1 mH (LW), giving frequency ranges of 550-1550 kHz and 150-280 kHz respectively. The LW coil was removed and kept for the LP loopstick (described later). An alternative MW coil is advertised in the USA by Antique Electronics Supply, under type number P-FRL.

Using the tuning circuit, as shown in Fig. 1, the MW coil will cover from about 550-2100 kHz. The use of a 0.375"-diameter salvaged MW coil of other manufacture may give a slightly different frequency range, but this can be compensated for (see later).

The loopstick is mounted on a loop "plug-in" chassis (Fig. 4). Construction is simple. The two ends of the ferrite rod are secured with plastic "P" clips, and the ends of the winding are soldered to the 4 mm plug pins.

To test this assembly, just plug the completed unit into the binding posts



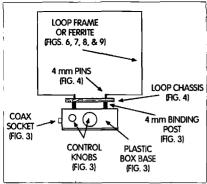


Fig. 5. General layout.

The Universal Loop continued from page 11

on the base unit [Fig. 2(b)]. Connect the unit to a suitable RX with a short length of coaxial feedline.

Set C2 to about 20% meshed. Select an MW BC station on the RX, and rotate

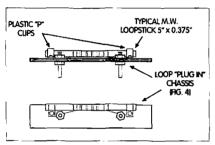


Fig. 6. MF (MW) loop — 550-2100 kHz.

C1A/C1B to resonance, which is indicated by a dramatic increase in signal strength. Gradually adjust coupling capacitor C2 for a gradual increase in signal strength, to a maximum peak, which indicates the required narrowest bandwidth. If the coupling is increased

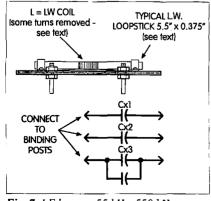


Fig. 7. LF loop — 55 kHz-550 kHz.

further, there will be a fall in signal strength and an increase in bandwidth. The operating point is at the peak signal. CIA/C1B may need a minor readjustment. The directivity range of this ferrite loop can be checked by rotating the loop.

NOTE: This testing/tuning procedure is used on all subsequent loops described.

The LF (long wave) loop — 150-550 kHz (see Fig. 7)

The construction of this unit is nearly identical to that of the MW loop just described.

A salvaged 0.375" diameter ferrite rod (with LW coil) can be used. However, the LW coil previously removed from the Maplin type LB12N MW/LW ferrite loopstick was slipped onto an 8" long x 0.375"-diameter ferrite rod. An Amidon #61 material rod would be ideal.

This coil assembly was fastened to a loop "plug-in" chassis (Fig. 4) with PVC "P" clips.

This unit was tested using the previously described method. The frequency range was found to be 135–425 kHz. To raise the HF end of the frequency range to overlap the LF end of the MW coil, some wire turns were gradually removed (step-by-step) until the HF end of the LW loop coil reached 550 kHz.

The assembly was now tested against a receiver, as previously described, and the revised range became 150 kHz-550 kHz.

55 kHz-170 kHz (see Fig. 7)

The above LW (LF) loopstick is used as the basis of an extended LF range by hooking a selection of capacitors across the coil. These silver mica or ceramic capacitors are each secured to a small strip of insulated card or board, with a wire soldered at either end. These wires are fixed across the coil by connecting to the screw terminal part of the binding posts.

Capacitor attachments are required as follows: 110 kHz to 170 kHz, use a 130 pF capacitor. 85 to 110 kHz, use a

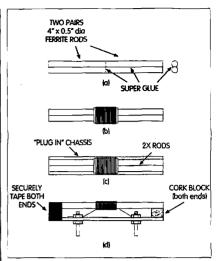


Fig. 8. The 1750-7700 kHz loop.

- (a) Ferrite assembly.
- (b) Winding assembly.
- (c) Final assembly, top view.
- (d) Final assembly, side view.

350 pF. 55 to 68 kHz, use a 1000 pF and 150 pF in parallel.

It follows that an even lower frequency can be obtained by using an even larger capacitor. Adjustment to the specified capacitor values will adjust the individual ranges to an enthusiast's needs.

The 1750-7700 kHz loop (Fig. 8)

This loop coil covers the next frequency segment up from the MW/MF loop previously described. It uses a ferrite rod core, but in this case a substantially larger core is used to increase the loop sensitivity. This large core is composed of 2" x 8" long 1/2"-diameter Amidon 61 rods. giving a core cross-section of approximately 1" x 1/2".

Four Amidon 61 rods, each 4" x 1/2" diameter are used (code number 61-050-400 from Amidon). Two pairs of 4" rods are cemented end to end with Super Glue to form two 8"-long rods. The two 8" rods are then cemented side-by-side to produce a 1" x 1/2" section core. See **Fig. 8**.

Next, wind on 2 layers of 2"-wide masking tape around the center of the rod. Over this, close wind 17 turns of 24 AWG PVC hookup wire (o/d = 2.05 mm). Leave 3" tails on the winding ends.

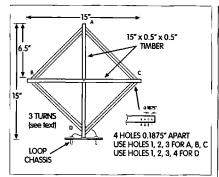


Fig. 9. The 4.300-14.500 MHz loop.

The above coil assembly is mounted on yet another loop plug-in chassis (Fig. 4) as shown in Fig. 8. The rod/coil assembly is uplifted from the loop chassis using cork blocks cut from wine bottle corks. Then securely tape into position as shown. The 3" tails of the winding are cut back, then securely soldered to the ends of the 4 mm plug pins.

Testing and tuning procedures are as previously described for the MW/MF loop, and should give excellent results from approximately 1750–7700 kHz.

The 4.300 MHz-14.500 MHz loop (Fig. 9)

Here a simple timber-framed spiral loop is used. A spiral winding is used, as it will give better nulling than a box-style loop.

A simple frame is made from two 15" x 1/2" x 1/2" lengths of hardwood timber. It is formed into a simple cross, as shown. It should be securely glued and bolted at the center of the cross.

Holes are drilled in from the tips of the crosspieces, as shown. The cross is then securely mounted to yet another standard loop plug-in chassis (**Fig. 4**). Use small nylon angle brackets.

Three full turns of PVC hookup wire are wound through the predrilled holes, as shown, with the ends soldered to the 4mm plug-pin ends.

Testing and tuning procedures are as previously described, and should give a frequency range of approximately 4.300 MHz-14.500 MHz, thus overlapping the previously described loop.

The HF to lower VHF Loop — 11.000 MHz-40 MHz (Fig. 10)

This is the simplest loop to construct. All that is needed are four lengths of brass tubing, each 12" long x 1/8" outside diameter, plus one 12" length of brass rod with an o/d such that it will just slip into the tubing. Also required is yet another standard loop plug-in chassis (Fig. 4). The brass tubing and rod were found in a store specializing in scale-model-making materials.

Assemble the brass tubing into a square loop as shown in Fig. 10. Fix

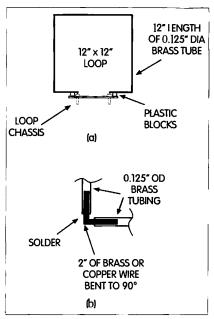


Fig. 10. The HF to lower VHF loop (11–40 MHz).

the four sides together at 90 degrees by cutting 2" lengths of the brass rod and bending them accurately to 90 degrees. After thoroughly cleaning the end, insert the resulting angles into the tube ends and securely and rigidly solder into a square. See (b) in Fig. 10.

Next, cut out a section of the bottom of the loop so that the ends lie on top of



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String Up the GPU 80

This compact antenna could be part of your clandestiny.

When you consider the installation of a new transmitting antenna, usually you first try to answer a few simple questions. From these answers hopefully you can come up with some desired specs, and, as a result, it then can be relatively simple to decide which antenna to D.I.Y.-construct or purchase commercially.

his formula was applied to the GPU 80 antenna. The answers showed that considerable ingenuity would be needed and several conventional textbook rules would need to be broken — or at least severely bent! GPU is an acronym for "General Purpose Utility."

Questions

- 1. Why is the antenna needed?
- 2. Frequency or frequencies of operation?

- 3. Location or locations?
- 4. Space(s) available?
- 5. Obvious physical installation problems?
 - 6. Earthing/grounding available?

Antenna specifications

The antenna might, during its lifetime, be required for outdoor, indoor, portable, vacation, or hidden use, on the 80 meter band; hopefully, it would also be usable on 40 and 20 meters.

The antenna must not exceed 6 feet

long when broken down for transit or storage. It must be possible to erect it horizontally, vertically, sloping, or just hanging down. It must be capable of being hidden from view in "antennahostile" areas. It must be possible to erect it or take it down in a few minutes. Compatibility with good, not-sogood, and indifferent grounding must be accommodated.

Simple, rapid loading and QSYing

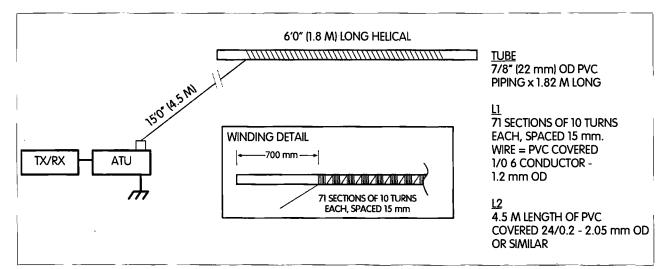


Fig. 1. Schematic of antenna.

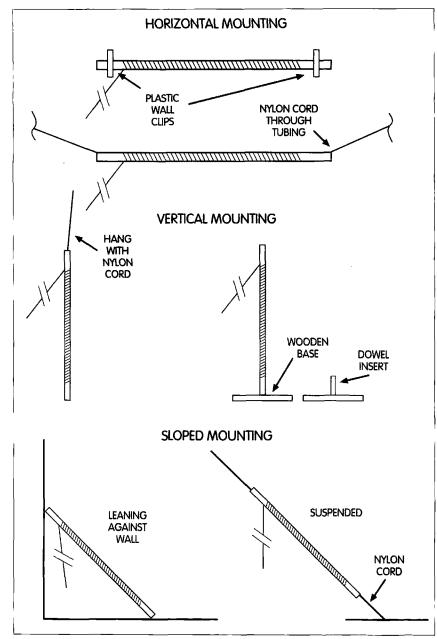


Fig. 2. Various mounting ideas.

String Up the GPU 80 continued from page 14

with a low SWR is a "must." This is definitely not a textbook antenna!

On the assumption that a 6-foot endfed helical antenna was the only probability, it was necessary to assess the best possible feeder length. The feeder would be part of the radiating antenna. The antenna would thus consist of the helical and the feedline (see **Fig. 1**).

In order to arrive at the most convenient length for the feedline, I taped a length of cord to the end of a 6-foot | 16 73 Amateur Radio Today • July 2000

length of wood dowel. This space model represented the final GPU 80.

I tried the 6-foot dowel in every conceivable position, both indoors and outdoors, as shown in Fig. 2. I determined that a 15-foot feedline would be the most convenient. Thus the antenna would be tailor-made to fit my circumstances.

Electrical design

A 0.251 antenna was the first that I considered, but it has an impedance of 35 ohms or less (though often er-

roneously fed with 50-ohm coaxial feed-line). 0.281 gives a 50 ohm terminal impedance (with reactance present), but a perfect ground, or ground plane, is necessary. Increase the length to 0.3751 and 70 ohms impedance is reached, with considerable reactance, which can be tuned out. Certainly the ground need not be quite so perfect as for 0.281.

Bearing in mind that the antenna might be mounted vertically, horizontally, or sloping, with a variety of grounds, I knew there would be changes in both electrical length and impedance at a given frequency. I decided to raise the impedance to just over 100 ohms when the antenna was mounted vertically, horizontally, or sloping. My assumption was that the impedance and electrical length would change depending on how and where the antenna was positioned, and on available grounding. I finally decided on a simple LC ATU to match the antenna impedance and frequency to the 50 ohms impedance TX [see Fig. 3(a)].

Using this technique, I was able to get excellent loading/radiation with low SWR, irrespective of a variety of antenna positions, orientations, and ground facilities (see Fig. 2).

Construction

The helical antenna L1 is wound on a 6-foot length of 7/8" outside diameter UPVC piping, obtained from a D.I.Y. store. The amount of wire used for this helical, plus the 15 feet of feedline, was first calculated for 3,500 kHz. (NOTE: A good rule of thumb method for calculating the turns/wire length required for a helical antenna is to remember that about twice as much wire is needed as on a straight wire antenna.) It is then usual to gradually prune the antenna to the exact frequency required. As a somewhat unknown territory was being entered, an extra 5% was added as a precaution.

After tuning and loading tests to L1 (Fig. 1), the end results consisted of 71 sections, each consisting of 10 turns of wire spaced 15 mm apart. These windings start at 700 mm from one end of the tubing (see Fig. 1, winding detail). The wire used is PVC-covered 1/0.6 mm conductor, with an o/d of 1.2 mm. This wire specification is mandatory.

A more robust wire was used for feedline L2, as this would be subjected to considerable stress and strain during relocations. The feedline wire was 15 feet of PVC 24/0.2 core, with an o/d of 2.05 mm. Any similar robust wire would suffice

Initial pruning, adjustment, and testing

The LI helical component was erected horizontally, suspended with a nylon cord lengthwise through the tube's center (see Fig. 2). An existing LC ATU was used [Fig. 3(a)]. A field strength meter was placed nearby to check for signal radiation. A small signal was fed into the antenna at 3.500 kHz, and the helical was then cut back turn by turn until resonance was reached. The antenna was then erected vertically, which effectively shortened the antenna from an electrical point of view. This horizontal/vertical exercise was repeated, and a few further turns removed, until the LC ATU would resonate the antenna through the whole 80 meter band, whether the antenna was horizontal, vertical, or sloping. At the same time a variety of grounds were tried, even including a large metal frame window with the antenna hanging out of the window.

The above "cut and try" exercise was somewhat lengthy and tedious. It is probably not always realized that many long established antenna designs now in textbooks were finalized by somewhat similar methods — e.g., the W3EDP.

The end result was the 71 segments (of 10 turns each) wound helically, plus the feedline of 15 feet.

"On-air" testing

During the above activities, it had been established that the lowest SWR occurred when maximum signal radiation was measured on the field strength meter. This meant that, in practice, the antenna could be tuned up on the radiated signal by variable capacitor C, and taps on L, on the LC ATU [Fig. 3(a)]. SWRs of near 1:1 were achieved when a reasonably good ground was used; they were about 2:1 when a wire fence was used for a ground.

Conveniently, on several days each week, a regular 80m CW contact is made with a friend in Germany, around 350–400 miles. This is usually around 0500 local time, with a frequency of 3,577 kHz ± ORM.

The helical was first erected across a room (suspended with nylon cord). The ground was a nearby water pipe. Using about 10 watts, the TX was loaded with the LC ATU for maximum field strength meter reading. No difficulty was experienced, and a good contact was established with the German friend. The following morning, the exercise was repeated with the helical mounted vertically, on the following day with the helical leaning against the wall (away from any house wiring). In all cases, the results I obtained were satisfactory. On the following three days, the exercise was repeated with the antenna outdoors. The results were satisfactory.

An existing "T" section commercial ATU was substituted for the LC unit. The results were similar, though it took far longer to set things up and OSY.

Many readers will have a suitable 80m band LC ATU. If not, you can build one of the simple designs that appear in the various antenna textbooks and magazines.

Ground connections

The antenna can be erected indoors or outdoors (see Fig. 2). The most convenient grounds are either the conventional station ground or a quarterwave ground wire laid on the ground (try it at various angles to the antenna).

An artificial quarterwave ground can be made by winding a halfwave of wire around a 6-foot length of 1" diameter wood dowel, using PVC-covered wire. This arrangement can work very well, providing that various positions and orientations are tried. I found that the best positioning is about 90 degrees to the feedline wire, either horizontal or vertical.

Yet another idea is to use a large metal frame window, a wire fence, or rainwater guttering or down piping, or just to drive a metal stake into the ground.

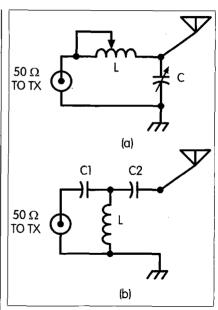


Fig. 3. Suggested ATUs. (a) L-C ATU. (b) TATU.

WARNING: Do not use the house electrical wiring ground! The result will be at best to pump RF through the house wiring; at worst, it can be extremely dangerous.

When you are satisfied with the end result, helical winding LI should be lap-taped with PVC tape and given a couple of coats of marine varnish (or similar) for weatherproofing. If the GPU 80 is to be hidden from hostile eyes in "antenna-hostile areas," then the PVC tape should be black, dark brown, or dark gray.

Other bands

Using the LC ATU, it is possible to load the GPU 80 through the whole 3.5 MHz (80m) band, though only low power CW is used here. With a suitable LC ATU, the antenna will load effectively on the 7 and 14 MHz bands.

Conclusion

The GPU 80 design, by necessity, contains many compromises. It is designed for horizontal, vertical, or sloping use, with a variety of grounding arrangements. It can be used outdoors or indoors, at vacation hotels or at portable sites. It can be packed up into a 6-foot length for transit or storage.

And it works! Somebody once said, "If an antenna works, it must be right."

Return of the Amazin' Hall Tree Vertical

This time, for 40/30.

My XYL is Queen of the Mixed Metaphor. She tells me that "hindsight is worth two birds in a bush." In spite of this sage advice, I cannot resist looking back over the years at many construction projects that were the result of my runaway curiosity. I am pretty much convinced that the old adage about curiosity and cats does not apply to us humans. It may be bad for felines, but as for me, it has taken me on many adventures. Here is one of them.

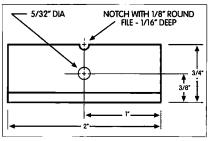


Fig. 1. Piece #1, made from 3/4" x 3/4" x 1/8" aluminum angle.

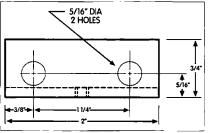


Fig. 2. Piece #2 (2 required), made from 2 Piece #1 turned 90 degrees.

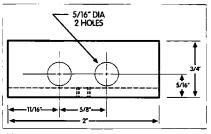


Fig. 3. Piece #3 (2 required), made from 2 Piece #1 turned 90 degrees.

couple of years ago, a dear friend jokingly quoted a saying to me, to the effect that "no good deed should go unpunished." Remembering instances where this would seem to be true has seemed to temper my curiosity somewhat when contemplating a construction project that is motivated by trying to be helpful.

However, it seems that curiosity has overcome my good senses once again. The result is this 40 meter version of my Hall Tree Antenna that appeared in the March 1998 issue of 73 Amateur Radio Today.

I don't consider myself a do-gooder, but do have compassion for those in situations that they do not like and can

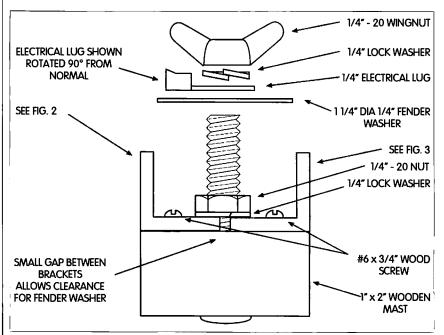


Fig. 4. Rod antenna mounting assembly (from the mast end).

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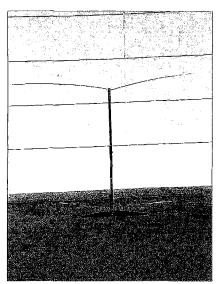


Photo A. The 40/30 Hall Tree Antenna.

do little about. Living in a community that has grown tenfold over a period of less than twenty five years, I find that it is not uncommon to hear the same story many times over on the local 2meter repeater. An amateur wishing to operate on the HF bands bemoans the fact that he is party to a covenant with a home owner association that prohibits him (or her) from having a permanent outdoor antenna. It would not seem likely that something which is not permanent and could be erected or taken down in a few minutes (like lawn furniture) would be covered in these covenants.

The Hall Tree Antenna meets these requirements and may be of interest to some with this dilemma, as it can be unpacked and erected, erected or taken down, and packed up in less than 10 minutes. Because the original version only operates upward from 20 meters, it may be of little use after the Sun goes down, when many wish to operate. Even though it is not one of my favorite bands, my curiosity would not be satisfied until a 40 meter version was built and tried. Having a spare of the original model made the task easier and gave me an opportunity to review it and make some changes.

The most notable changes are the telescoping replacement antennas and their mounting. Two new mountings are required and each holds two removable, 6-foot (RS #270-1408) replacement

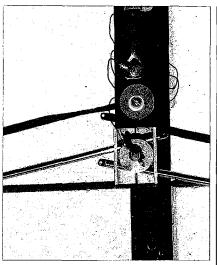


Photo B. View of the rod antenna mount with the masts folded.

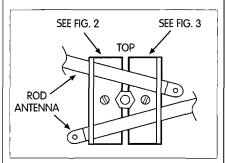


Fig. 5. Positioning of the rod antennas. Top view shown, with wing nut, lockwasher, lug, and fender washer missing.

rod antennas. In this design, they are intended to be inserted into each mounting and secured in place by a 1/4" x 20 center bolt, fender washer, and wing nut. When held horizontally, these antennas have the rigidity of overcooked asparagus. In order to prevent the lower elements from resting on the ground, the new mount points them upward at a somewhat rakish angle of 15 degrees. Unlike the original version, all the elements are operated horizontally. Adjustment is still the same; the upper elements are fully extended, and tuning is done by equally adjusting the lower antenna lengths.

In order to accommodate the new mountings, changes were made in some dimensions of the upper and lower masts. The balun coil is the same as in the March 1998 article, but the balun coil (with insulation) and SO-239 connector are now mounted

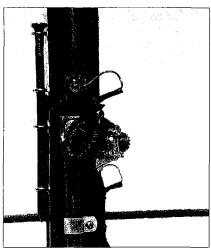


Photo C. The center, showing SO-239 connector, pigtail lead from balun, and binding post connection.

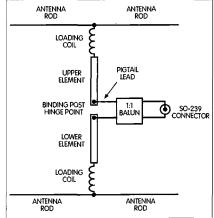


Fig. 6. 40/30 meter antenna schematic.

on a 2" x4" piece of 1/8" aluminum. This is fastened to the side of the mast (see photo). The 1"x 2" wooden mast lengths are changed. The upper mast is 43-1/2" and the lower mast is 47" long. The 3/4" or less (not critical) diameter copper elements are now 39" long.

Intended for single band operation, each of the two loading coils consists of a single winding of 30 turns of #18 insulated copper wire wound on Amidon Associates T-106-6 powdered iron toroidal cores. For 30 meter operation, 27 turns are needed. Each is secured to each mast with a 1-1/4" wood screw and insulating washer made from 1/4" tempered Masonite.

Any shortened ground-mounted version of a dipole antenna operated amid

Twinleads To Go

Keep these emergency antennas for 2m and 70cm in your glovebox.

Twinlead VHF antennas have been described in many articles, but far too often the bandwidth is far too narrow, especially for emergency use where low power is the norm and you need all the edge you can get. The VHF and UHF antennas described here have very low SWR, broad bandwidth, and they really work.

oth antennas are the popular "J" type, a derivation of the old "Zepp." They use ordinary 20-gauge twinlead (Radio Shack #15-1174) and a 10-ft. length of RG-58 or mini RG-8 coax with a PL-59 on one end. That is about as low-cost as you can get, and the antennas are very easy to make.

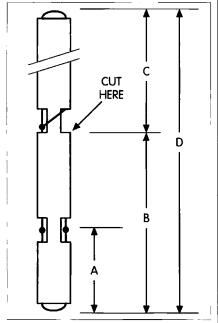


Fig. 1. Antenna layout.

The 2-meter antenna can, of course, be operated as a harmonic antenna on the 70 cm. band, and it has very low SWR across the band from 430 to 450 MHz. Just bear in mind that harmonic antennas have their major lobe of radiation up at an angle instead of toward the horizon where you really want it. For this reason, data is given for a 70 cm. antenna operating on its fundamental resonant frequency.

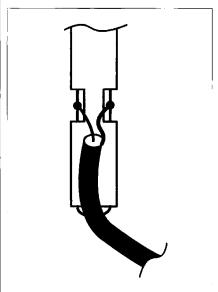


Fig. 2. Detail of the coax connection.

Two-meter antenna

An MFJ-249 SWR analyzer was used to determine the final dimensions on the 2-meter antenna, and the SWR readings were 1:1 at 146 MHz and 1.2:1 at 144 and 148 MHz.

Antennas are affected by objects in their immediate environment, so your results may vary a little from mine, but they should not differ greatly. During the tests, the antenna was hung by a nylon cord about 6" below a tree limb, and the bottom of the antenna was about 3 feet above the ground.

The SWR readings were virtually the same across the band when the antenna was connected through a Radio Shack #19-320 VHF/UHF SWR meter

Ant. Freq.	Dimensions, inches				
	Α	В	Ç	D	
144– 148 MHz	2-3/8	17-1/2	30-1/2	48	
430- 450 MHz	1-3/16	5-3/4	11-1/2	17-1/4	

Table 1. Dimensions for the twinlead antennas.

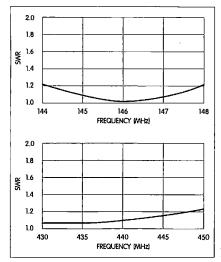


Fig. 3. SWR charts for the 2m twinlead

to a RS HTX-202 transceiver. The SWR meter was mounted directly onto the transceiver with a BNC/SO-239/ dual PL-259 adapter. In addition to local area repeaters, I was easily able to reach systems that were 25 miles away. The MFJ-249 doesn't reach 450 MHz, so I used a RS HTX-404 transceiver to check the 2-meter antenna on this band. Mounting the VHF/UHF SWR meter directly onto the transceiver gave me SWR readings of 1.1:1 at 430 MHz, rising gradually to about 1.25:1 at 450 MHz.

70cm antenna

Lacking an SWR analyzer for this band, I used the RS HTX-404 transceiver and RS #19-320 SWR meter to arrive at the final dimensions. The antenna was hung in the same position described for the 2-meter antenna. The SWR readings were virtually flat 1:1 across the band from 430 to 450 MHz. I again raised repeaters some 25 miles away, with good signals in both directions.

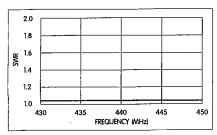


Fig. 4. SWR chart for the 70cm twinlead antenna.

Construction notes

Layout data for both antennas are given in Figs. 1 and 2. Dimensions are given in Table 1.

Lay the twinlead flat and straight so that the measurements will be accurate. The quarter-wave matching section, dimension "B" in Fig. 1, is very critical in that a small change in this dimension results in a significant change in the frequency at which minimum SWR occurs. For example, on the 2-meter antenna, if you find that the SWR is higher at 144 MHz than it is at 148 MHz, the matching section "B" is too short. If the SWR is higher at 148 MHz than at 144 MHz, the matching section "B" is too long.

Strip the plastic insulation away, as shown in the drawing, using a knife or small soldering iron. On the 70cm antenna, remove all of the plastic between the shorted end and the coax connection points.

The cut wire is connected to the radiator element at both the top and bottom to eliminate a floating wire, and it effectively makes the radiator fatter, which helps a little to broaden the bandwidth. It also provides a loop at the top for hanging the antenna.

The coax is centered in the middle of the stub and lies directly against it. A #18 solid copper wire is connected as a jumper from the coax braid to the cut side of the matching section.

Both the hot end and the coax end of the matching section are taped using clear, transparent packaging-type tape. Use only a couple of wrap-arounds, just enough to provide a little stiffening. Don't overdo it. There was no noticeable change in readings after the tape was applied.

Conclusions

Simply because of responses to previous articles, it may be appropriate to add a little explanation. The absence of math, formulas, velocity factors, etc., is no accident. All of these are good, even necessary, as starting points. But when you embed antenna wire in plastic it becomes necessary to go to the "empirical" solutions. That's just a twodollar word for cut, try, and adjust, again and again and yet again. Sometimes antennas are not "designed" they are arrived at.





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The Hybrid Vee

Revisit the original Taylor Vee — and improve it.

You may recall "Charlie" Taylor's "The Taylor Vee 20m Antenna" article that appeared in the May 1998 issue of 73 Amateur Radio Today: a rotatable twenty-meter inverted vee that was intended to solve the average radio amateur's problems of limited real estate and difficulty of adjusting the antenna for minimum SWR.

In the new Taylor Hybrid Antenna, Charlie has revisited the general principles of the original Taylor Vee, but moved one leg of the vee to a vertical position parallel to the supporting structure. Charlie's reasoning is that a strong vertical component of radiation, as well as the expected horizontal component from an inverted vee-type antenna, will improve the antenna's DX capabilities ... and so it has turned out.

Reference to the original article will show virtually all of the construction features, procedures and materials of the hybrid antenna as well, except for some added details of the vertical element. However, for those who don't have the original article available, a complete description of the Taylor Hybrid Antenna follows. Please refer to the figures as you read the description.



Photo A. The tuning stubs are tough to see in these photos, but give it a try.

Description

Inverted vee antennas generally exhibit maximum horizontally polarized radiation at right angles to the plane of the antenna, while fairly deep nulls exist off the ends. The hybrid antenna is intended to overcome this apparent deficiency by providing significant vertically polarized radiation from at least one end of the antenna, without sacrificing the other desirable features of the original Taylor Vee. In addition, the Taylor Hybrid reduces the "wingspan" of the original by half, making it even easier to install on a small lot.

The hybrid antenna is mounted on a framework consisting of a length of 2" x 2" lumber, a length of PVC pipe, and a length of metal chain-link fence rail. (See Fig. 1.)

The entire assembly is light enough to be rotated by a small TV-type antenna rotator available from Radio ShackTM.

The mast consists of a 1-1/4"-diameter metal fence rail on which the antenna framework is assembled. A light metal fence post (about 2"-diameter pipe) is driven about two feet into the ground and serves as the basic framework support. The TV rotator is mounted at the top of the fence rail

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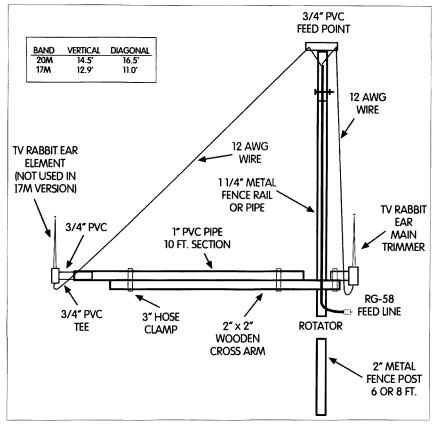


Fig. 1. The 17 or 20 meter Taylor Hybrid Antenna, showing a tuning stub for both the vertical and slanted wires.

(about 6 feet above ground). The entire antenna assembly and support frame is mounted to the TV rotator.

Clamp the 10-foot section of 1-1/4" diameter fence rail into the TV rotator. A single length of 3/4"-diameter PVC pipe is slip-fitted into the top end of the fence rail, leaving about two feet extended from the top of the mast. Drill through the mast and PVC pipe for a bolt to secure them together. At the top of the two-foot PVC pipe extension, place a 3/4"-diameter PVC pipe tee, which becomes the hybrid antenna feedpoint.

Just above the TV rotator, and on

Mast	1-1/4" x 10-ft. chainlink fence rail		
	One 8-ft. length 2*x 2* lumber		
Boom	One 10-ft. length 1*-diam. PVC pipe		
1	10-ft. length 3/4*-diam. PVC pipe (to be cut to needed lengths)		
2	TV rabbit ears or telescoping whips		
3	3/4" PVC pipe tees		
2	TV U-bolts		
	THNN #12 AWG insulated wire sufficient for desired number of antennas		
1	TV antenna rotator		
RG-58 C/M coax (suitable length, antenna to shack)			
Misc. nuts and bolts			
1	2"-diam. metal fence post		

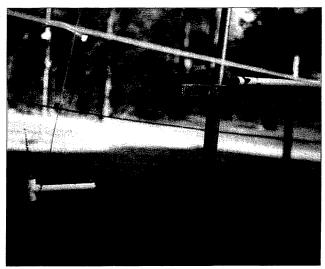
Table 1. Parts list.

one side of the mast, mount a horizontal antenna support (or "boom" in sailboat terms) consisting of a ten-foot, 1"-diameter PVC pipe firmly attached with 3" hose clamps to the 2" x 2" length of lumber. The inner end of the 2" x 2" lumber is drilled to accept a U-bolt which secures it to the mast.

Further extend the outer end of the PVC pipe by slip-fitting into it a threefoot length of 3/4"-diameter PVC pipe. Then attach, in an upright position, a 3/4"-diameter pipe tee to the end of the



Photo B. Another chance to spot the stubs — but you get the idea. | Photo C. Close-up of stub.



Tuner King Strikes Again — Part 2

Make a basic VHF/UHF signal source from your TV/VCR tuner.

Part 1 of using a TV/VCR tuner as a signal generator covered a discussion of the frequency range, tuner connections, and three of the four basic tuner types. Here, part 2 will continue with tuner types, adjustments, calibration, and output amplitude.

nal generator is required, then a mechanical variable UHF tuner (Fig. 1) will work well in your application. The typical tuning range of the oscillator is 480–900 MHz, but that range can be modified to cover a higher top end or a lower bottom end. However, both an increase in the upper frequency and decrease in the lower frequency to widen the tuning band are not likely.

Tuning to a specific frequency is somewhat difficult because of "fast" tuning. If the tuner has an AFC/AFT terminal, then fine tuning can be implemented. A potentiometer-controlled voltage (typically 2 volts maximum) is applied to the AFC-AFT terminal.

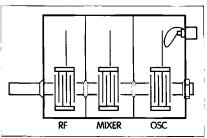


Fig. 1. Mechanical variable UHF tuner with placement of an oscillator pickup loop.

Should it be desirable to move the oscillator's tuning band, built-in adjusters are available. Mounted alongside the resonator is a loop of wire that is grounded on both ends. The loop functions as an inductor that is in shunt with the resonator. Moving the loop closer to the resonator will raise the frequency of oscillation, and moving the loop away will lower the frequency.

In addition, some tuners have a metal paddle mounted adjacent to the variable capacitor. The paddle functions as one plate of a capacitor and is used for top capacitive loading on the resonator. Moving the paddle closer to the variable capacitor lowers the frequency, and moving it away will raise the operating frequency.

Increasing the top loading of the resonator may also be accomplished by placing a low value trimmer capacitor (0–12 pF) between the oscillator's variable capacitor and the top edge of the tuner's case. The addition of top loading will, in addition to lowering the operating band, also narrow the total tuning range.

If the desire is to lower the operating band, then wire jumpers should be installed in both the RF and mixer circuits to prevent them from interfering with the oscillator through RF energy absorption. Lowering the frequency of the oscillator will place it within the tuning band of the RF and mixer circuits.

Adjustments and calibration

Adjustments to a tuner involve modifications required to shift the operating frequency range and installation of the pickup loops. The important first step is to measure the oscillator frequency range as it exists before modification. A frequency counter can be used to measure the frequency.

Place the counter's antenna close to, but not touching, the oscillator's resonant circuit or attached directly to the signal output connector. Because each tuner design is different from the next, I can only provide suggestions as to suitable methods for shifting the frequency range of the oscillator. But if shifted lower by at least 47 MHz, the RF and mixer resonators will cause an interference problem. The RF and mixer resonators in the electronically tuned tuners may be disabled by shunting the "hot" end of each of the resonators to ground with a large value

capacitor such as a 0.01 µF. A capacitor is suggested because a jumper wire might ground out the varactor bias if it exists on the resonator.

The UHF oscillator is the easiest to move, because adjustment devices are designed into the tuner for that purpose. Alongside the resonator is either a wire loop (inductor) or a metal paddle (capacitor). These devices can be identified by inspection. Moving the loop or the paddle closer or farther away will shift the operating frequency band.

Adjusting the frequency of the VHF band oscillator presents a greater challenge than the UHF. Coils are used for the VHF low and VHF high resonators. In most cases, the coils appear to be mashed, and they were mashed intentionally to shift the tuning range to cover the TV band. Some band shift in tuners may be accomplished by squeezing the turns closer or separating them. Adjusting the coils doesn't accomplish very much, so leaving them alone is my best advice.

When coupling loops are being used, they should be in their final position before making a final frequency chart. Positioning the coupling loop involves finding the best position of the loop to achieve maximum output. Monitoring the relative output level can be accomplished with a peak detector and a sensitive indicator as shown in Fig. 2. My preference has

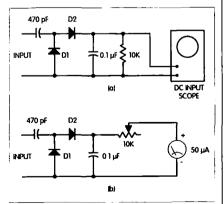


Fig. 2. RF peak detector and sensitive indicator used for adjusting the output coupling loop. Circuit (a) uses a DC input oscilloscope as an indicator, and (b) uses a sensitive microammeter as an indicator. D1 & D2: 1N34, 1N82, 1N295 or equivalent point contact RF diode.

been the use of a DC input oscilloscope, as it operates at a lower indication threshold than a meter.

I've found that operating the oscillator at the lowest frequency in each band works best while initially positioning the loop. When the optimum position has been found, then shift the frequency to the high frequency end for a final tweak of the loop position.

Once the resonators and loops have been adjusted as desired, a counter may be used to measure the frequency of the oscillator as a function of tuning voltage. Setting up a frequency chart in either 0.5 or 1.0 volt steps is a suitable starting point for calibration. A smaller voltage step may be used for specific band segments. As a suggestion, a frequency vs. tuning voltage curve for desired band segments may be plotted on graph paper. A full range chart is shown in Fig. 3. The graph becomes a useful "tool" for tuning the signal source to specific ham

Output amplitude

band frequencies.

The direct output amplitude from tuner oscillators is suitable as a signal source for receivers and other high impedance applications. As a caveat, the output amplitude across the tuning band will vary because there is no builtin signal leveling.

Table 1 shows the RMS voltage amplitude that I obtained from one tuner with and without an amplifier, but the data is representative of what other tuners exhibit. The pickup coupling factor has a direct affect on the signal output amplitude, and that's why the loop needs to be adjusted with care.

If a higher signal amplitude and/or higher output power is required, then

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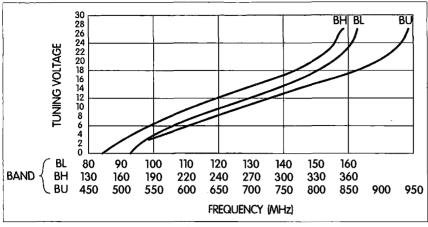


Fig. 3. Typical graph that translates between tuning voltage and frequency for three tuner bands.

an amplifier may be added into the output circuit. I've been using an NEC UPC1651G MMIC as an output amplifier, and it has provided reasonable results even though it exhibits some gain rolloff as 900 MHz is approached. Within the dynamic range of the MMIC, I've realized a voltage gain up to 10:1. However, there is a gain variation vs.

frequency issue due to the amplifier layout that could be "fixed" with some design considerations.

Although I'm experimenting with

Although I'm experimenting with the more readily available Mini-Circuits MAR3 device, the final results are not complete. However, the use of the MAR3 device is promising.

Both the NEC and MAR3 devices

will drive a 50 ohm source quite well, if that's a requirement. Fig. 4 shows the schematic for both devices and the use of a 500 ohm potentiometer that is used as an output level control.

Conclusions

If you've been in need of a VHF/ UHF signal generator, perhaps a TV/VCR tuner modified to function as a signal generator will meet your needs. The internal oscillator of a tuner will generate a signal in the range of about 90 to 900 MHz. Although there are holes in the tuning range,

	Freq.	Volts	Volts
	(F)	(E)	(E)
Band	Osc	Direct	Amplifier
BL	96 MHz	500 mV	2000 mV
	187 MHz	700 mV	1100 mV
ВН	146 MHz	350 mV	1400 mV
	345 MHz	300 mV	600 mV
BU	466 MHz	5 mV	300 mV
	950 MHz	10 mV	100 mV

Table 1. Relative RMS voltages values obtained from one tuner modified to be a signal generator. Data is shown with and without an amplifier. A load impedance approaching 1000 ohms was used during the measurement.

the frequency coverage is very useful.

The output amplitude, though adequate for many applications, may not be as high as some projects require. A MMIC amplifier may be added into the output circuit to increase the tuner's output amplitude by as much as ten times.

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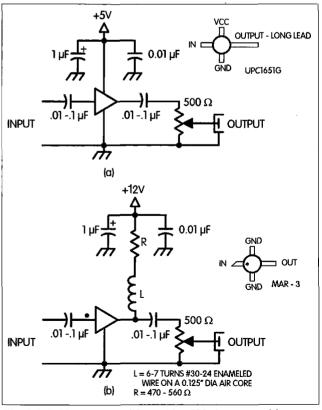


Fig. 4. Suitable output amplifiers with a 500 ohm pot used for output level control. (a) shows an NEC UPC1651G MMIC, and (b) shows the use of a Mini-Circuits MAR-3 MMIC.

CALENDAR EVENTS

Listings are free of charge as space permits. Please send us your Calendar Event two months in advance of the issue you want it to appear in. For example, if you want it to appear in the October issue, we should receive it by July 31. Provide a clear, concise summary of the essential details about your Calendar Event.

JULY 4

BRESSLER, PA The Harrisburg Radio Amateur's Club will host their 28th July 4th Firecracker Hamfest on Tuesday, July 4th, at Emerick Cibort Park in Bressler PA (near Harrisburg). The fun begins at 8 a.m. General admission \$4, XYLs and harmonics admitted free. Tailgating \$5 per space. Tables \$12 each before June 1st, \$15 on or after June 1st. Setup on July 3rd, 6 p.m.–9 p.m.; setup on the 4th at 6 a.m. VE exams will be held nearby at 9 a.m. For more info call the HRAC AnswerLine at (717) 232-6087; E-mail [HbgRAC@excite.com], or visit the Web site at [www.members.tripod.com/hrac].

JULY 8

PETOSKEY, MI The Straits Area ARC's 25th Annual Swap & Shop will be held Sat., July 8th, 8 a.m.—12 p.m., at Emmet County Fairgrounds, Petoskey MI. US 31, 2 blocks west of 131. Tickets \$4, tables \$5 (splits OK). VE exams 1 p.m. at the American Red Cross Bldg. For testing info contact Floyd KG8CS, (231) 526-5503. For general info contact Tom W8IZS, (231) 539-8459; or Dirk KG8JK, (231) 348-5043, E-mail [kg8jk@gsl.net].

SALISBURY, NC The Rowan ARS will sponsor the Salisbury Firecracker Hamfest, Sat., July 8th. From I-85, take exit 76B to Salisbury. Turn right at the ramp intersection with E. Innes St. Turn left on S. Boundary St. (Captain D's/McDonald's intersection). Go two blocks to find the Salisbury Civic Center — hamfest site on your left. Doors open at 8 a.m. Admission \$4 in advance, \$5 at the door, Indoor tables \$5 each as long as they last. Talk-in on 146.73 (W4EXU) tone 94.8; backup on 146.52 simplex. Walkin VE exams. For more info call Jim Morris KA4MPP, (704) 278-4960; or Carol Maher W4CLM, (704) 633-6603. Send mail to Rowan Amateur Radio Society, P.O. Box 593, Salisbury NC 28145. E-mail [rbrown@ salisbury.net].

JULY 9

PITTSBURGH, PA The North Hills Amateur Radio Club's 15th Annual Hamfest will be held July 9th, 8 a.m.-3 p.m., at the Northland Public Library, 300 Cumberland Rd. Pittsburgh PA; approx. 10 miles north of

Pittsburgh on McKnight Rd. (Truck Route 19). At the 3rd traffic light after Northway Mall, turn left onto Cumberland Rd. Northland is on the left at the top of the second hill. From points north, take Route 19 south toward Pittsburgh. Follow signs for McKnight Rd., and at 4th traffic light turn right onto Cumberland Rd. If on Perry Hwy., turn left onto Cumberland Rd. at the Sunoco. Talk-in and check-ins will be on 149.09 W3EXW North Hills Club rptr. Free admission and free parking. Paved tailgating, 1st space free; additional \$5 each. Handicapped accessible. For more info contact Keith Ostrom KB3ANK, 205 Poplar Dr., Pittsburgh PA 15209, tel. (412) 821-4135; Bob Ferrey, Jr. N3DOK, tel. (412) 367-2393, E-mail [n3dok@ pgh.net]; or see the club's Web site at [www.nharc.pgh.pa.us].

JULY 15

LOVELAND, CO The Northern Colorado ARC will host their annual Summer Superfest from 9 a.m.–4 p.m. at the Larimer County Fairgrounds, 700 Railroad Ave. Talk-in on 145.115(-) 100 Hz PL, or 146.52 simplex. VE exams, commercial exhibits, technical sessions, computer and radio goodies, and more. Reserve tables from *Rod Cerkoney* (970) 225-0117. For general info, call (970) 352-5304.

WELLINGTON, OH NOARSFEST 2000 will be held at Lorain County Fairgrounds in Wellington OH. Gates open 8 a.m.-2 p.m. Check-in and directions on NOARS rptr. 146.10/.70. Dealers: Ample indoor commercial space, reservations required. Huge outdoor flea market area. Overnight parking for RV's and campers. No hookups. Indoor 8 ft. tables are \$15 each. All workers must have an admission ticket. No tickets included with tables. \$5 per 8 ft. space in flea market area. Admission \$5 each at the gate, children under 12 admitted free. Walk-in VE exams: register 8-9 a.m. Exams start at 9 a.m. NODXA DXCC card checking. Cards must be in by 11 a.m. For info, contact John Schaaf KC8AOX, tel. (216) 696-5709, E-mail [kc8aox@gsl.net]. Snail-mail to NOARSfest, P.O. Box 432, Elyria OH 44036-0432.

JULY 16

VALLEY FORGE, PA The Mid-Atlantic ARC will hold their hamfest at Kimberton Fire Company Fair Grounds, Rte 113 — south of the intersection with Rte 23. Talk-in on

146.835(-) and 443.80(+). Computer and electronics hobbyists are welcome. Indooroutdoor space: indoor tables with electricity, 1–4 for \$10 each, 5 or more, \$8 each, not including admission. Tailgating, \$5 the day of the event. Admission \$5. Contact MARC, P.O. Box 2154, Southeastern PA 19399; or call Bill Owen W3KRB at (610) 325-3995. E-mail [hamfest-info@marc-radio.org], Web site [http://www.marc-radio.org/hamfest.html].

JULY 22

CINCINNATI, OH The 3rd Annual OH-KY-IN ARS Hamfest will be held at Diamond Oaks Career Development Campus, 6375 Harrison Ave., Cincinnati OH. This large facility is located just east of I-275 and I-74. Take I-74 to the Rybolt Rd./Harrison Ave. exit (exit #11). Go east on Harrison Ave. Diamond Oaks is located on the right (south side) of Harrison Ave., less than one mile from the I-74 exit. Talkin on 146.670(-) and 146.925(-) rptrs. Admission \$4 in advance, \$5 at the door. Age 12 and under free. Features will include special seminars, transmitter hunts, and indoor vendors. Outdoor flea market spaces are free of charge (with admission) for the first two, with additional spaces at \$3 each. VE exams at 8 a.m., walk-ins accepted. Free parking. Handicapped parking available. Indoor vendor tables (6 ft. with free electric), \$8 each. Contact Lynn Ernst WD8JAW, 10650 Aspen Place, Union KY 41091-7665. Tel. (606) 657-6161; E-mail [wd8jaw@arrl.net]. Visit the Web site at [www.qsl.net/k8sch].

JULY 23

SUGAR GROVE, IL The Fox River Radio League will hold their annual Hamfest at Waubonsee Community College, Rte 47 at Harter Rd., Sugar Grove IL (5 miles NW of Aurora). Talk-in on 147.210(+), PL 103.5/107.2. Doors open Sun. at 8 a.m. Setup Sat. at 7 p.m., Sun. 6 a.m.–8 a.m. VE exams at 10 a.m., bring original license, copy of license, and photo ID. Contact Maurice L. Schietecatte W9CEO, c/o FRRL, P.O. Box 673, Batavia IL 60510. Tel. (815) 786-2860 or E-mail to [w9ceo@arrl.net]. The Web site is at [http://ww.frrl.org/hamfest.html].

JULY 28-29

OKLAHOMA CITY, OK The Central Oklahoma Radio Amateurs will sponsor its 27th annual event, "Ham Holiday 2000," at the Oklahoma State Fair Park (Hobbies, Arts & Crafts Building), northeast of the I-40 and I-44 intersection. Talk-in on 146.82. Doors open Fri., July 28th, 5 p.m.—8 p.m.; Sat. July 29th, 8 a.m.—5 p.m. Features: Technical and nontechnical programs, fox hunt, WAS card check, VE exams, and a flea market. Admission fee \$7 in advance, \$9 at the door. Flea market tables \$10 in advance, \$15 at the door, if available. Electrical hookup \$5. Additional info and registration forms available on the CORA Web site, [www.geocities.com/heartland/7332]. Address other inquiries to Ham Holiday 2000, P.O. Box 850771, Yukon OK 73085-0771; or E-mail [n1lpn@swbell.net].

JULY 28-30

FLAGSTAFF, AZ The 49th Arizona State Convention and Hamfest, sponsored by the Amateur Radio Council of Arizona, will be held at Ft. Tuthill in Flagstaff AZ. Some of the features will be manufacturers, dealers, exhibits, seminars, VE exams, a huge swap, camping, and more. Gordon West WB6NOA will present two of his famous seminars, and (TBA) will be the guest speaker at the Sat. night BBQ. Other speakers, seminars and forums include Dan Miller from ARRL headquarters, Bill Pasternak from Newsline. AMSAT, APRS, Ten-Ten, Ladies programs, QRP, and an ARRL Forum. For more info contact Amateur Radio Council of Arizona, PO Box 312, 16845 N. 29th Ave., Ste. 1, Phoenix AZ 85053-3041. E-mail [arcathill@aol.com]. Voice mail (602) 779-2722. Visit the Web site at [http://www.Hamsrus.com].





AUGUST 5

ITHACA, NY The Tompkins County ARC will hold the Finger Lakes HAM-IN (hamfest and fly-in) at Tompkins County Airport (KITH), 3 miles NE of Ithaca. Large hangar for indoor vendors and displays. Drive-in setup. Paved outdoor flea market and parking. Airplane rides and aviation displays. Pancake breakfast and BBQ lunch served by Boy Scout Troop 80. Admission \$5, under 18 free. Indoor tables \$10. Outdoor space \$2 each. VE exams, walkins welcome. Talk-in on 146.97. Contact Richard Spingarn (607) 387-5251.

AUGUST 6

CROOKED LAKE, ANGOLA, IN The Annual Land of Lakes ARC Hamfest will take place at Steuben County 4-H Fairgrounds, corner of 200 W and 200 N, Exit 150 off of I-69. Talk-in on 147.180 and 444.350. Packet 145.510. Tickets \$3 in advance, \$4 at the gate. Indoor tables \$8; trunk sales \$2. Vendor setup Sat. August 5th, 3–10 p.m., Sun., August 6th, 4–7 a.m. Free parking. Camping, swimming, amusement park and outlet shopping malls nearby. Contact Bill Brown, 905 W. Parkway Dr., Pleasant Lake IN 46779. Tel. (219) 475-5897. E-mail [sharon.l.brown@gte.net].

MARSHFIELD, WI The Marshfield Area ARS will hold their 10th Annual Picnic "HAMNIC" on Sun., August 6th, starting around 11 a.m. Potluck, swapfest. The location is Wildwood Park in Marshfield WI. Talk-in on 147.180. All are welcome. Contact Guy Boucher KF9XX, 107 West Third Street, Marshfield WI 54449. Tel. (715) 384-4323. Packet: KF9XX @ W9IHW. E5.Ai.WI.USA.NA. E-mail [guyboucher@tznet.com].

AUGUST 20

LEXINGTON, KY The Central Kentucky ARRL Hamfest and Computer Show will be held at National Guard Armory, adjacent to the Lexington KY airport. From I-75 Exit 115, follow signs to the airport (KY 922 south 1.5 miles, New Circle Rd. west and south 4.6 miles, to Exit 5, Rte 60 West 1.5 mile, turn south at the traffic light. Take Man O' War south 1.3 miles, Parker's Mill west 1.2 miles, right onto Airport Rd., left onto Armory grounds. Talk-in on 146.760(-). VE exams (contact Bob Cooper AF4OI by August 9th, at (606) 272-6460); or E-mail [AF401@cs.com]. Other features include an ARRL Forum, technical forums. commercial vendors, indoor flea market, airconditioned building. Outdoor flea market. powerline-safety demo, aeronautical mobile demo, and special event station outside. Kentucky Horse Park, museums, and other family activities nearby. Handicapped accessible. Free parking. Free overnight selfcontained camping. Admission \$5 in advance, \$6 at the gate, Vendor setup Sat., 6 p.m.-8 p.m., and Sun. 6 a.m.-8 a.m. Tables \$15 if payment received before August 9th; \$25 afterwards. E-mail/phone reservations confirmed upon receipt of payment. Tailgating free with admission. For further info, or to preregister, contact John Barnes KS4GL at [KS4GL@juno.com], (606) 253-1178 evenings; or SASE John Barnes KS4GL, 216 Hillsboro Ave., Lexington KY 40511-2105.

SPECIAL EVENTS, ETC.

JULY 1-2

DeSMET, SD The Lake Area Radio Klub/ Huron ARC WØWTN will be on the air from 1700Z July 1st to 2200Z July 2nd, to commemorate Laura Ingalls Wilder, author of *Little House on the Prairie*. Frequencies: 7.265, 14.265, 28.465, 50.165. A certificate will be available. Write to *LARK*, *Box 642*, *Watertown SD 57201-0642*.

JULY 23

STRATFORD, NY The Fulton County Dr. Mahlon Loomis Committee will operate W2ZZJ on July 23rd, to commemorate the 174th anniversary of the birth of Dr. Loomis, the American radio pioneer. Loomis was born at Oppenheim NY on July 21st, 1826. Operation will be from 1300–2000 UTC on the General class phone portion of 75, 40, and 20 meters, and on the Novice 10 meter phone band; also, on area 2-meter FM repeaters. For a certificate and extensive literature, send QSL, contact number, and a #10 SASE (55 cents) to George P. Sadlon W2ZZJ, 5738 STHWY 29A, Stratford NY 13470. Visit the Dr. Mahlon Loomis Web site at [http://members.xoom.com/mahlon/].

AUGUST 19-20

ENGLEWOOD, NJ The Englewood (NJ) ARA. Inc., invites all amateurs the world over to take part in the 41st Annual New Jersey QSO Party. The time of the contest is from 2000 UTC Sat... August 19th-0700 UTC Sun., August 20th; and from 1300 UTC Sun., August 20th-0200 UTC Mon., August 21st. Phone and CW are considered the same contest. A station may be contacted once on each band — phone and CW are considered separate bands. CW contacts may not be made in phone band segments. New Jersey stations may work other New Jersey stations. The General call is "CQ New Jersey" or "CQ NJ". New Jersey stations are requested to identify themselves by signing "DE NJ" on CW and "New Jersey calling" on phone. Suggested frequencies are 1810, 3535, 3950, 7035, 7235, 14035, 21100, 21355, 28100, 28400, 50-50.5, and 144-146. Suggest phone activity on the even hours, 15/ 10 meters on the odd hours (1500 to 2100 UTC); 160 meters at 0500 UTC. For complete rules, please contact Englewood Amateur Radio Assn., Inc., P.O. Box 528, Englewood NJ 07631-0528.

Bill Pasternak WA6ITF Broadcasting and Teleproduction 28197 Robin Avenue Santa Clarita CA 91350 [billwa6itf@aol.com]

The Rocky Road to a Great Radio Club

An interview with Jeff Seligman WA2VNT/7.

A long, long time ago, in a city far, far away, I spent my latter teenage years on a band called 6 meters, using a mode called full carrier Amplitude Modulation. It was the late '50s and early 1960s. The place was the "free and independent nation of Brooklyn, New York," and every ham strove to have the best-sounding audio on the airwaves.

Back then, it was easy to tell the wheat from the chaff — those who built their transmitters from those who bought them — by the audio characteristics. Within a few weeks a newcomer could tell a Gonset Communicator from a Viking Challenger or a Lettine 242. Every radio had its own peculiar "sound" and those who wanted to stand out from the rest usually rolled their own.

From the time I was first licensed until I bought my first transceiver (a National NCX-3 and P+H Transverter to 6 meters), I built at least two dozen 6 meter AM transmitters. Some were attempts to improve the "sound" of my signal. Others, like the famed "Hairy-Modulated 6146" were more for fun. Fun as in "Well, OM, you have plenty of audio, but it sounds — well — kind of hairy!"

During my rather abbreviated student career at the New York City Community College of Applied Arts and Sciences (then recently opened in the abandoned Brooklyn Pickle Works building), one of the assignments was to build and demonstrate a working amplitude modulated transmitter. There was no restriction on frequency, although

the instructors cautioned to try to keep the output power under 150 milliwatts and the signal contained in the broadcast band. As a result, many students came up with nothing more than the then-popular single tube "phonograph oscillator" transmitters — but built on a chassis that could have housed a half gallon on any band.

I would have none of that! With lots of transmitters under my belt, a ham radio callsign of WA2HVK, and access to both the college metal shop and WA2INM's seemingly unlimited supply of "used but good" parts. I set out to build something a lot more utilitarian. I was going to fit at least 20 watts of good 50 MHz RF and high level processed plate modulation into a box that was about 7" high. IO" long and 6" deep! It would operate on 6 meters; it would be fully metered; it would have the audio quality close to the then popular WABC "Musicradio"; and it would be a transmitter that the school would long remember.

We were given two or three weeks to complete our transmitters. Cramming all that "good stuff" into such a tiny box — complete with power supply — took all of it. In the end, it delivered

what was expected of it and more. Using a Techcraft CC-50 converter and Lafayette HE-10 receiver tied to one dipole to receive and this miniature (for its time) transmitter tied to another dipole — both hung inside the classroom — I hit the transmit switch and uttered forth the words: "This is



Photo A. The author (left) was a guest at last October's hamfest in Tucson. Photos courtesy WA6ITF.



Photo B. Jeff Seligman WA2VNT/7.

WA2HVK portable 2 testing. Testing 1-2-3-4-5. Hello, test. This is WA2HVK testing and clear!"

I have no idea if the school "long remembered" my transmitter, but that class sure was impressed. The RF section was nothing special. Just a 2E26 with 350 volts on its plate fed by a 6AW8 oscillator/multiplier. But the audio section was something else again. A 12AX7/ECC83 was the preamp, a 6C4 served as processor/limiter. Its output went to a 12AU7 split-load phase inverter that fed a pair of type 6AQ5A beam power pentodes (Class AB1) and produced a clean 12 watts of audio. That was more than enough to fully modulate the 20 watt RF section. The positive impression came from the people around the city of New York and northern New Jersey who one after another called to tell me how good the "rig" sounded. Musicradio it wasn't, but an A+ it got me.

What does a ham do with a new transmitter that gains him immediate complaints on its audio? He replaces his old one with it. And that's exactly what I did. Throughout 1961, that transmitter was my own "sound" that set me away from the crowd.

Like all hams of the day, I was always wanting something better. I figured that if I could cram 20 watts into a 10" wide cabinet I should be able to cram 60 watts into a 3" x 5" x 7" BUD

chassis box. To pay for the new "rig" I put the old one up for sale. It was purchased by a teenage ham from Flatbush, Brooklyn, named Jeff WA2VNT.

Well, the 60 watts in a tiny box was a disaster. I won't go into all the details. Suffice to say that in the days of tube-type amplifiers, there were some laws of physics that could not be broken. And when you tried to circumvent them, disaster was right around the corner. Or as WA2INM was often heard to say: "... some ideas work, and others smoke resistors."

In the middle '60s, I moved over to SSB and lost contact with my old AM friends. It would be several decades before Jeff and I would again cross paths. That happened when he also moved to California in the late '80s. In the early 1990s, he once again relocated to Tucson, Arizona, and this is where our story really begins.

You see, Jeff's introduction to ham radio clubs in Tucson was far from auspicious. In fact, it was a real downer to him, after being a part of one of the West Coast's most vital ham radio organizations. But let's let him tell the story.

The Interview

WA6ITF: You came to Arizona from California, where you were involved with several radio organizations. What did you find in Tucson?

WA2VNT/7: I came to Arizona in December 1992 and started attending radio club meetings in 1993. As it came closer to Field Day, I saw there was a lot of factioning in the clubs as to how Field Day would be dealt with, how the new hams would be integrated in. And in this case they were not invited as they [the clubs] wanted to have the best operators. The net result was that a lot of the newer hams felt totally left out.

After Field Day, I talked with a number of hams and assessed the situation. And I found that what was happening was that there were so many different technologies involved with communications, that it was very difficult for any one club to have all members holding the same interest at any one time.

Here in Tucson, they also have a very large computer club called the Tucson Computer Society. I went to one of its meetings and learned that they had found a way to get around the problem by organizing "Special Interest Groups" — or SIGs — that meet outside of the regular club meeting time and at a different location. Further, each SIG has members whose interest deal with a specific issue. When the members of these SIGs come to the regular club meeting they each are given time to present a report. Also, each SIG has its own column in the club newsletter, where the SIG leader summarizes what's happening within that group. This allows the general membership at a meeting to discuss the various SIGs and decide which ones each wants to be active in. And that's when I realized it was time to form a new radio club here in Tucson. The "Radio Society of Tucson."

WA6ITF: A new radio club? Why form a new one?

WA2VNT/7: I formed the club because there was no club that dealt with the interests of newer radio amateurs, including amateurs with computer interests and packet radio interest.

What Tucson had was TAPR (Tucson Amateur Packet Radio, Inc.). It had another club that dealt primarily with contests — primarily on HF. Then they had another club at the University of Arizona and yet another that dealt with repeaters and emergency communications. There is also a separate DX group.

What I saw was heavy fractionation. Each ham would be interested in only one thing and not another. But what I also saw was an alienation of the newer hams.

WA6ITF: Describe what you mean by alienation.

WA2VNT/7: Well, some of the newer hams wanted to know what Field Day was about. All that the club wanted to do was to set up a team of five hams to strictly operate HF CW, and they did not want any inexperienced radio amateurs at the Field Day.

I felt slighted. I had come from California and the club that I had belonged

to — the Conejo Valley ARC — held the record for winning the greatest number of consecutive Field Days, the largest number of Field Days over a ten year period, and I think that they have also beat the highest all-time score under Steve Katz WB2WIK. There was even a video made about the CVARC Field Day that anyone can buy. And, even though CVARC didn't have SIGs, they did have committees. As a result, CVARC was able to place a fine focus on anything.

I tried to point out that the new operators are primarily interested in digital-based communications as well as more traditional forms. Also, that many newcomers are only on VHF and UHF and may not know much about the Morse code but that they are willing to learn. But to organize a Field Day as a contest the way in which this one club did was not right - it is primarily a demonstration of emergency preparedness. Also, that scoring in Field Day is maximized for the greatest number of members in a club participating and operating the most number of stations. In other words, simulating the worst possible emergency situation yields the highest score. CVARC has proven this in Southern California — year after year after year.

WA6ITF: So what you are saying is that there was this total fractionalization.

WA2VNT/7: In Tucson, the older operators could not seem to understand the needs of the newer operators and vice versa. So I tried to explain to the older operators that what they were doing would be great in a contest, that in Field Day it would not give them a winning score regardless of the number of contacts made. Also, that their plan circumvents the primary purpose of Field Day, which is to introduce the community to the newer hams as well as show these new operators how to operate properly under emergency conditions.

After I spoke, a number of hams approached me who were interested in doing a different kind of a Field Day operation. They wanted to know how to organize it. As a result, over the

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summer of 1993 I formulated plans for a new type of amateur radio club based on the computer club model of Special Interest Groups, so that each area of amateur radio and the needs of each community within the amateur radio structure could be represented. In the fall of 1993, I organized a meeting where I proposed this new kind of club based on SIGs that could become a thriving entity that would have a constantly renewing aspect to it. It would never become obsolete or outdated, because anytime it needed a new interest it could form another Special Interest Group.

As it stands now, this club has a SIG for CW, another for packet, another for APRS, yet another for repeaters, and numerous other specialties.

WA6ITF: So, what you are saying is that if someone invented whoop-dedoo modulation, there might be some club interest in it?

WA2VNT/7: Exactly. And we would go to the club's general membership and tell them that we need some money for this new SIG and maybe you can raise some through donations of equipment or whatever. And the club does it — or — in other words — the purpose of the club is really to meet the needs of its SIGs and for the SIGs to provide something back to the club. It's reciprocal.

By way of example, we have a Special Events Coordinator and under him a station operating at the Pima Air Museum. A first! And that area of special interest — we call it Community Awareness — is just one of many.

WA6ITF: So you are saying that your club is doing things to involve the world outside ham radio with the club?

WA2VNT/7: Let's just say that will permit community awareness of amateur radio and what we are doing. We are not as far along as CVARC, but at the same time we are doing things that CVARC did not do. These SIGs are at national sites and call attention to ham radio on a national basis.

The Pima Air Museum ham radio operation is an excellent example. The museum is a wonderful resource that lets people know the kind of sacrifices that were made during World War 2 as

well as shows all of the aircraft and explains the conditions under which people had to fight that war.

WA61TF: OK. A hypothetical situation here. You find yourself back home in Brooklyn New York. It's a city with little ham radio cohesiveness. How would you apply the concept there?

WA2VNT/7: I would think that in a large city, that this would be even more successful than in a smaller city. In a large city, you have very varied interests, along with a large number of amateur radio operators bringing in a diverse cross-section of culture — especially in New York City, which is culturally diverse to begin with.

New York City is really a prime target for an organizational structure like this. For instance, you could have a SIG group for Emergency Communications — and as I remember, Brooklyn had a very active ARES and RACES. It's really a case of using your imagination as the needs arise.

WA6ITF: Relate this to kids. Carole Perry WB2MGP, who produces the Youth Forum for the Dayton Hamvention, tells me she is having problems getting young hams as speakers.

WA2VNT/7: Young kids nowadays are very computer-oriented. To have a club where all that is talked about is HF CW DXing is of no appeal to younger kids. This is a worldwide ham radio problem that is — ironically — better addressed on the Internet.

Our partial solution is an "Internet Gateway" that is not only tied to a packet station but also serves as a conversation link. Through that gateway you can converse with amateur radio operators worldwide who are also on the Internet, or you can choose to bring up the packet system and connect to other packet people. It's such a clean switch that when you are on packet you cannot tell if a station coming in from - say, Russia - if it's calling in on packet or via the Internet. There is no distinction — it is fully integrated. This crosses that barrier between the Internet and amateur radio.

WA6ITF: Then you see a kind of

synergy between ham radio and the Internet?

WA2VNT/7: We were very quick to recognize the power of the Internet and how useful it could be. As a result, we were the first club in Tucson with a home page on the Web. We have had it there since the club began, courtesy of AA7VX, who is an ISP.

We also have an AX-25 "ham gate" for which I hold the STA and operate with WB7TLS. It's a joint station that we have been running and anyone can get on, access WB7TLS, and message through the system to the Internet. And, lest I forget, we also have a Tucson-wide packet network on the air as well.

WA6ITF: You also have something in Arizona not found in many other places, that being a statewide organization.

WA2VNT/7: That's true. We have ARCA—the Arizona Council of Amateur Radio Clubs. Its existence makes it a lot easier for statewide issues to be resolved.

WA6ITF: All of this is great, but is it self-perpetuating? If Jeff WA2VNT/7 decides to move to Milwaukee, what happens to ham radio in Tucson?

WA2VNT/7: In one sentence: I know that the Radio Society of Tucson will survive. This is because its structure has that self-renewing feature I told you about earlier on. It will always renew itself because of its structure based on Special Interest Groups. At least I hope it will.

Epilogue

By now, there has to be at least one question on every thinking ham's mind: "Can SIGs save my club from the oblivion it seems headed toward?"

I'll keep the answer to this one very short. It worked in Tucson, but you will never know if it's the answer to your needs unless you give it a try.

Resources

Bill Pasternak WA6ITF can be contacted by E-mail at: [billwa6itf@aol.com].

Jeff Seligman WA2VNT can be



When They Say Multiband, They Mean It!

73 reviews the Comet CA-UHV antenna.

Have you put off running HF mobile because you don't want a large, ungainly antenna interfering with the aerodynamic shape of your new car? Maybe you haven't added HF because the XYL is only willing to tolerate one ham antenna per vehicle. Maybe you drive a company car and they have rules prohibiting permanent or significant changes to their vehicles. If so, you just ran out of excuses. Here is an antenna that is easy to install, presents an unobtrusive silhouette, covers multiple bands, and most importantly, provides performance!

Tomet Antennas has long offered exceptional antenna products for amateur radio use. I have used one of their OE-14 models for twenty meters for better than two years, with excellent results. Many a long trip has been made much more enjoyable by having the ability to ragchew with another stateside station or work a little DX. I've been accused of being one of those real radio nuts who feels that a car looks naked without an array of antennas.

Actually, although I appreciate the appearance of an antenna, I'm far more interested in what it can do. My normal complement usually includes a 2m/70cm antenna for local communications and the 20m Comet, and at times I also add a 10m antenna to work the FM repeaters.

Needless to say, I take a fair amount of teasing about my car looking like a frustrated porcupine (or worse) from friends who do not appreciate the finer things in life. Recently, my trusty old UHV/VHF antenna gave up the ghost after seven years of use. Some would feel that this would provide an excuse to replace the existing antenna with a similar type. Au contraire! Part of the enjoyment of our hobby is the quest for the new and exciting, so I seized the opportunity and began to look at what options might prove interesting.

The ideal mobile antenna?

What features would the ideal mobile antenna have? It should be easy to mount to the car without drilling holes through the car body - particularly through a portion of the body which shows, such as the roof or a fender. It should be large enough to perform effectively but not so large as to be unwieldy. It should cover the bands I frequently use, with a minimum of fuss when changing bands.

Okay, that's a lot to ask, and I assumed that I would have to use a minimum of two antennas to permit me to operate APRS on the VHF bands even when I'm working HF. Imagine my pleasant surprise when I found that there was a single antenna which could meet ALL my needs! I can now operate on the bands I normally use with only one antenna which can be easily installed, easily stowed, and just as easily removed.

The Comet Model CA-UHV is the antenna I needed, and it presented one pleasant surprise after another. About the only thing predictable about it was the fact that it is vertically polarized.

Let's start at the bottom and work our way up. The CA-UHV has a PL-259 mount, which seems to be the most popular style of antenna mount in use today. This mount also lends itself to special applications and experimentation. There are many UHF and VHF antennas with PL-259, but there aren't as many HF radiators. This means that there arc many antenna mounts available which provide the matching SO-239 mount. Some of these are fairly heavy-duty and can be adjusted to ensure that the antenna is correctly oriented, which makes the Comet antenna a likely candidate to occupy that place of honor on your vehicle.

There are SO-239 mounts which can be installed on the trunk lip of most cars, and for larger vehicles there are luggage rack mounts and mirror mounts which will work equally well. For people with antenna restrictions for the home station, Field Day or emergency operations, the PL-259 mount means that you could design a fixed mount for this antenna without requiring a machine shop in the garage. With a little experimentation, this Comet antenna just might end up doing double duty!

For mobile use, I prefer a trunk lip mount, which is easy to attach and works well for my car. Don't forget that in most cases it will work better if the antenna is on the driver's side of the car, since tree branches tend to be lower the closer you get to the curb. If you do choose a trunk lip mount, make sure that you position the mount far enough back so that you can open the trunk without hitting the rear window of the car. Securely fasten the set screws on the mount to provide both mechanical integrity and an electrical connection.

I use cable ties to secure the coax to the trunk lid and a point near the hinge. Then, after passing it under the back seat, I merely route it under the door trim until I get to the front of the car. If your radio is floor-mounted, you may just bring it under the car seat and then under the carpet to a small hole. For an in- or under-dash-mounted rig, you can continue the coax run under the plastic panels until it can be secured under the dashboard.

Configuring the Comet CA-UHV

After routing the coax to the operating position, it then is time to determine exactly how you wish to configure your Comet CA-UHV. The antenna comes packaged with the main mast and a selection of resonators. By selecting the correct resonators, this antenna can easily be configured to run three, four, or five bands, and can operate on even more under special circumstances. If you have a radio which includes HF through two or six meters, you will soon realize why this antenna is just about perfect for you.

This antenna needs no special configuration and probably will not need any tuning for six meters or higher. In most cases, it only requires that you plug the coax into the radio and screw the antenna onto the mount. Most of us have the urge to check and recheck the SWR just to see how close to that perfect match of unity we can get. This precision has more to do with bragging rights on the air than any functional purpose, but it is important nevertheless.

Hook up your handy SWR meter between the transceiver and the radio and

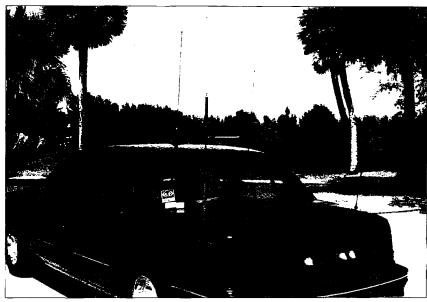


Photo A. Before - Here's my car with a twenty-meter antenna on the trunk lid, twometer/seventy-centimeter glass mount antenna and ten-meter magnetic mount on the roof. I've been accused of having a car that looks like a porcupine.

see how it looks. Personally, I find 1.5:1 to be more than acceptable, and when I tried this antenna, it was well below this for throughout both the 2m and 70cm bands. If you want to fine tune the antenna for 6m or 2m operation, a set screw at the base of the antenna can be loosened and modest adjustments made to the length of the mast. For 440 MHz, there is a tube called a "choke pipe" on the lower section of the mast which can be raised or lowered to adjust the tuning. The choke pipe has a waterproof cap at the top which should be moved first to make the adjustment easier. If you choose to adjust the antenna for these frequencies, you should be able to

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PATENT PENDING



Photo B. After — With the Comet CA-UHV antenna on the trunk lip mount, I've kept all of the capabilities that used to require three antennas. Plus, I can swap out resonators to add other HF bands as my needs and band conditions change.

achieve close to a 1:1 ratio at your center frequency and less than 1.5:1 for 2m and 440 MHz. About 75% of the 6m band should be less than 1.5:1, with the remainder only slightly higher.

But wait! Was I looking for just another line-of-sight antenna? Absolutely not! That's why I mentioned the advantage of having a multiband rig which can handle HF frequencies as well. The CA-UHV has a threaded fitting at the top of the mast into which

one of the resonators can be installed. The antenna comes standard with resonators for 40m, 15m, and 10m, and there are optional 20m and 17m resonators which you can purchase separately. Decide which bands you intend on working, then select the appropriate resonator. If you travel only during the day, 40m might not be your first choice, but with band conditions as they have been recently, 10m has been great during the day.

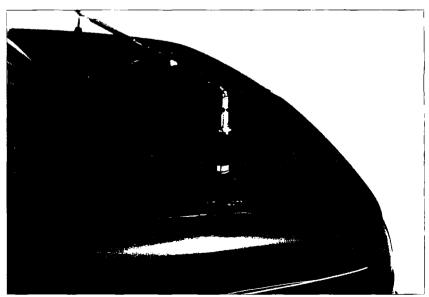


Photo C. When pulling into the garage at night, the CA-UHV folds over to permit easy clearance of the garage door.

At this time, unless you only plan on operating a single HF band, it might be a good idea to install each resonator and adjust the SWR. I personally do not attempt to operate CW or RTTY while driving, so my suggestions for a mobile installation will focus on the voice bands. If you examine each resonator, you will notice that it has a coil from which an element extends. At the iunction of the two, there is a set screw which can be loosened to allow the length of the element to be changed. If you cannot retract enough of the element to properly tune the element, then you must cut the element. Be cautious and cut only a very short amount! It is very easy to cut too much. Fortunately, Comet includes an extra element for each resonator (thanks, guys). but it's better to not need these.

It is important to determine which segment of the band interests you most, and then tune accordingly. For ten meters, I found that I could get about 750 kHz at an SWR of less than 2:1. If you have FM available, you will probably wish to ensure that you have the ten meter repeater frequencies within this range (which would probably be from just under 28.9 MHz to the top of the band). If you have made friends in the Novice and Technician Plus segment, you'd probably want to center your tuning at 28.68 MHz to include this segment up through about 29 MHz. For the 10m band, each centimeter will move the frequency about 500 kHz.

Fifteen meters is another good daytime band, and the Comet CA-UHV will give you better than 2:1 SWR through an almost 300 kHz range. This should let you cover the entire voice sub band for all license classes with no difficulty. Again, if you find it necessary to trim the element be very careful because each centimeter will shift the frequency by about 350 kHz. For forty meters, you will be able to select about a 35 kHz segment with the SWR less than 2:1.

With some multiband antennas, you need to stop the car and change resonators or make some other type of physical adjustment before switching bands. With others you may have multiple resonators pointing in different

directions, but these usually require some type of guying to prevent the antenna from spontaneously bending over at highway speeds. The Comet CA-UHV allows you to put one resonator at the top and another at a ninety degree angle to the main mast. This means that you can operate two HF bands, plus the 6m, 2m, and 440 MHz. Actually, you could add the other resonators, if you added some guying or if you were parked for Field Day or disaster communications support. For most of us, though, five bands is more than enough to keep us busy while on the road.

One of the great benefits of this system is that you can pick and choose according to your needs. If most of my traveling is going to be at night, I may install the 40m and 20m resonators. During the daytime, however, particularly with the sunspot activity we have now, I may stick to 10 and 15 meters—changing resonators is easy.

Incidentally, each has a locking nut, so after screwing in the resonator, make sure you put a wrench onto the locking nut and tighten it. Considering how much you bounce around in the car, it's only safe to assume that the antenna is taking at least that much vibration. I recommend that you pick the lowest frequency band you expect to use and install it on the top of the mast, which will determine the overall height of the antenna. If you choose 40m, the antenna will be just about eight feet tall, which is enough metal in the air to do the job without presenting a

Frequencies	7, 14 (option), 18 (option), 21, 28, 52, 146, 445 MHz	
	7-54 MHz: 0 dB	
Gain	146 MHz: 3.4 dBi	
I	445 MHz: 2.15 dBi	
	120 W SSB	
Max power	52 & 146 MHz: 200 W SSB	
Impedance	50 Ohms	
Weight ·	460-580 grams	
Length	1.9 meters (maximum with 40m resonator)	

Table 1. Specifications.

structural challenge. Shorter resonators can be mounted on the side adapter without placing unnecessary stress on the mast.

With the PL-259 mount, the CA-UHV can be easily removed when you park your car at the airport or in a questionable location. On the other hand, when pulling into your garage at night, there's no need to remove the antenna. Just above the base of the antenna is a knurled collar which can be unscrewed then lifted. Once lifted, a hinge in the antenna mast is exposed and the antenna can be laid down to clear the garage door opening or other obstruction. To make this even more convenient, you can rotate the shaft to lay it down in any direction.

A few options to consider

I've mentioned that there is a 20m resonator available as an option. I like working 20m, since it offers benefits during daytime and nighttime operations. On the other hand, there are so many "big guns" running high power and significant antenna arrays that you may feel intimidated. Don't let that stand in your way, since signing as a mobile will sometimes catch the attention of that exotic DX station. I've had many times on 20m where I've hooked up with another mobile that I heard in a pileup. There's kind of an interesting camaraderie out there that you might enjoy. Of course there are now more mobiles showing up on 17m, too, and there's now a resonator available for that band as well.

A key accessory that I'd highly recommend is Comet's duplexer. A duplexer permits you to use a single antenna for more than one purpose at the same time. You may be familiar with duplexers through your local repeater if it uses the same antenna for transmission and reception. I have used the Comet CF-706 to allow me to connect my VHF/UHF radio and my HF rig to the CA-UHV antenna. If you have an extended range rig with two antenna connections, the duplexer will let both outputs use this antenna.

Summary

Comet has done it again. I've always

been satisfied with Comet antennas, and the CA-UHV is another winner. It has the features I want and it's easy to use. If you are looking for an outstanding multipurpose antenna for your mobile rig, take a good look at the CA-UHV.

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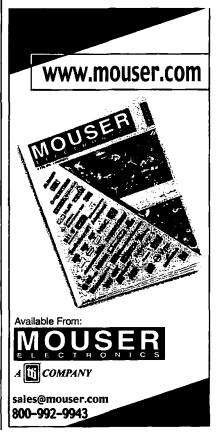
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A Safe LED Optical Transceiver System — Part 2

Last month, we got into the basics of the LED transceiver system. This month, let's get into a more detailed description of this system and cover the tripod mounting and aiming scheme. Additionally, we will cover the main mount that holds all components together and makes a tight package that is rigid for transportation. Also covered is the LED transmitter schematic and modulation scheme.

I am leaving the receiver local oscillator system description for next month, as the engineering schedule is being pushed as fast as we can to get testing done on a simple replacement for the LO we used, a "synthesizer" local oscillator. Just need time for construction and development to complete the receiver system. Let's get back into the construction, taking up where we left off last month and covering focus and making the system rigid.

Here are more tube and mount construction details. In its finished form, there are two tubes of 4-inch PVC pipe (colored black internal), one holding the receiver and its Fresnel lens, and the second tube holding the LED, lens, and the rest of the transmitter circuitry. The two tubes are held together in a binocular fashion to keep them symmetrical and both pointing in the same direction. The tubes were separated by

rectangular aluminum tubing holding both plastic tubes firmly in place. Actually, the aluminum rectangular tubes were scrap aluminum 4 GHz waveguide used for the main support, and an 8 GHz waveguide short section for the scope mount. Common shower mounting molding sections were bandsawed into short "U" brackets used to position the plastic tubes in alignment with the outer edge of the "U" channel. The base of the "U" channel is bolted to each side of the main support aluminum tube, making a rigid arrangement for both 4-inch pipe assemblies and the center support member.

On top, centered between the TX and RX assemblies, a section of smaller rectangular aluminum was used to mount a rifle spotting scope for aiming of the system. The spotting scope positioning is accomplished by using an 8 GHz section of aluminum waveguide about five inches long. One end

(front) has a screw down firmly through the body into the main rectangular center support; the other end has a short section of the top of the tube cut away, leaving a 3/4-inch tab on the bottom. This tab is slotted with a circular file for horizontal alignment of the rifle scope.

An "L" bracket is fixed to the upper portion side of this tube and used to mount the rifle scope by cutting and shaping the short bottom section of the "L" bracket to accept the original scope mounting mechanism. The front of this "L" bracket is fixed to the top front side of the small mounting section. The rear of this bracket is slotted in a vertical manner, giving vertical adjustment for the spotting scope.

After the system is constructed as far as optics, electronic circuitry, and mechanical mount considerations go, alignment and prime focus for each of the receiver and

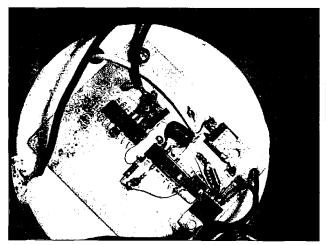


Photo A. Photo of the LED transmitter showing the mic amp and PLL 4046 chip that drives the LED mounted on other side of the two pipe caps cemented together back-to-back.

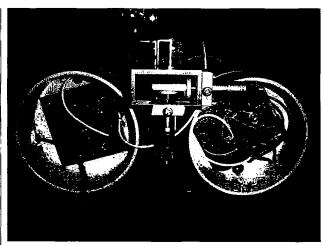


Photo B. Photo of mounting for both 4-inch TX and RX main optics housings mounted together with aluminum "U" brackets on each side of the main rectangular support.

transmitter optics and electronics need to be addressed. The receiver detector is centered in its housing and adjustment is made by sliding the lens in its splice union for best received signal. The transmitter is done similarly by watching the LED spot for best focus on a target about 10 to 15 feet away. Additionally, use a calibrated caliper to center the LED and detector within the cap where they are mounted.

To accomplish distant alignment of both transmitter and receiver and rifle scope, a small reflector is positioned a few hundred feet away and the system is pointed towards the remote reflector (I used a bicycle reflector). The LED transmitter and receiver are positioned using a tripod for best return RF as detected on the 2 meter HT's S-meter. Use an attenuator to prevent overloading of the HT. Align the rifle scope at the remote reflector to calibrate both the optics and the rifle scope. See Photo C for scope mounting details.

Once you are satisfied with focus, marks are made on the tube to locate where this focus point is situated. These marks locate best focus position for the end caps and splice union joint. These marks will then be used to position the caps and splice unit to confirm that they have not moved from prime focus while you were drilling retaining holes to be tapped for 6-32 screws. The plan here is to insert three screws threaded into the soft plastic cap and pipe material. The screws will hold the caps and lens assembly in firm position, giving the entire unit some rigidity.

On my unit, I drilled three concentric holes evenly spaced in convenient places and tapped them for 6-32 screws to fix the assembly in place. You might want to fix the caps in place temporarily with duct tape while drilling to prevent movement of the material. Don't even think of using glue for the plastic, as when repair or modifications are required, you will be "stuck." The 6-32 screws can be taken apart easily, and give simple access to the internal components should servicing or adjustment be required.

Retest again, with the remote bicycle reflector mounted 100 feet or so distant. The LED was pointed towards the reflector, noting the return signal strength from the return reflection on the S-meter of our 2 meter HT. It was adjusted for maximum S-meter reading. Then the two screws for vertical and horizontal scope alignment were adjusted to bring the scope into alignment, placing the reflector in the crosshair of the spotting scope.

The following is an E-mail transmission from Kerry N6IZW, telling his views about the system he designed and the excitement we both feel about this safe and simple setup. Here is the message Kerry addressed to members of the San Diego Microwave Group:

Subject: Having fun with through-the-air optical communication

The ARRL 10 GHz & Up contest held each year also includes optical communications over a minimum distance of at least 1 km. I played with low power lasers a few years back and did not like my first experience at trying to communicate over a two mile path. We were using surplus 5 mW lasers mounted on heavy-duty camera tripods and spent probably most of an hour trying to aim one of the lasers at the receiver at one end (we finally did make it). The pointing was way too critical for standard pan/ tilt tripod adjustments, and when we did get on target, the intense laser light left Chuck WB6IGP with a headache for two days.

Two weeks ago, I decided to try again using current LED technology for the transmitter. I constructed one transmitter consisting of a Radio Shack red LED rated at 5000 mcp @ 20 mA (660 nM) at one end of a 12" long, 4"-diam. plastic sewer pipe housing with a Fresnel lens cut from a sheet-reading





Photo C. Photo of the rifle scope mounting on top of the main rectangular support. The "L" bracket for the scope mounting is slotted on the rear end of the main mount for vertical movement to align to scope to the LED light source. The bottom of the mount rear is slotted for horizontal alignment of the same scope.

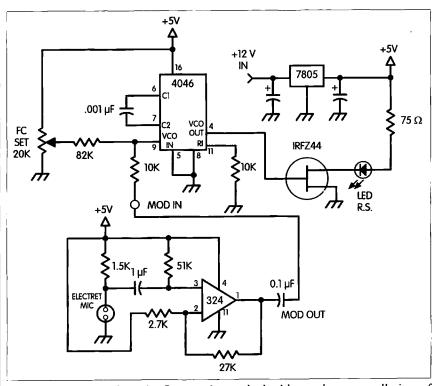


Fig. 1. Transmitter schematic. Construction made dead-bug-style on a small piece of copper PC board material. The LED is mounted inside the front section of two caps cemented back-to-back. The rear cap assembly houses the electronics for the modulator (LM-324) and the VCO PLL chip (4046). The 75 Ω resistor is really adjustable from 75 Ω -200 Ω . Start with 220 Ω and adjust so that 34 mA max. flows in LED.

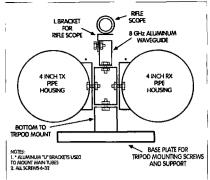


Fig. 2. Rear view of mounting method to hold both 4-inch pipes to large rectangular center support and "U" brackets mounting and holding the pipes together. The main center mount was a large section of rectangular waveguide, but any stout aluminum tubing could be used here. Another section is attached to the main bottom tube to form an extension to attach to a tripod base plate, giving clearance for the 4-inch tubes.

magnifier on the other end. The LED is driven by a power FET connected to the output of a 4046 PLL IC running as a VCO at 35 kHz. This provides a 30 mA average square wave drive to the LED. An electret microphone and op amp provide audio to modulate the VCO for NBFM communication.

The receiver consists of the same lens/pipe arrangement with modified surplus I/R remote control receiver. The I/R receiver was chosen because it appears to have a nice large area PIN photo diode with no I/R filter in front. The unit circuitry was modified to provide linear output as a preamp rather than a digital output for control purposes. The received 35 kHz from the preamp is upconverted to 145.035 MHz through a simple upconverter consisting of a 3036 PLL circuit and an SBL-1 mixer. This allows the use of a standard 2m radio as the NBFM receiver. It also allows a 2m all-mode radio to be used in SSB mode for weak signal detection and initial alignment.

The initial testing and alignment was performed using a bicycle reflector mounted out about 250 feet. The transmitter and receiver were mounted on separate tripods with a rifle scope mounted on each tripod as well, which was adjusted to point at the red spot returning from the reflector when the received signal was maximized. There are noticeable problems with parallax at this distance. This was followed by pointing the two units at each other over the 250-foot distance and measuring the carrier to noise. The values indicated the system should be capable of perhaps 4–8 miles.

I completed two transceivers with the help of Chuck. We tried an across-the-yard shot, which was of course very easy with full quieting of the FM receivers. On 2/24, we set up about 2.2 miles apart and tried again. The hardest part was spending a few minutes locating each other, as Chuck had moved to a location on Mt. Helix which was not where I was expecting him. We briefly used strong flashlights (and 70 cm radios) to locate each other, and aligned the scopes on the transceivers to the flashlight spots. We immediately had usable signals, which were improved to full-scale S-meter deflection and full quieting upon additional position adjustment.

The red spot is very noticeable but not at all hard on the eyes, and the pointing is very reasonable for a good tripod setup (same tripods we use for our microwave contacts). Using a calibrated S-meter on my end showed the carrier-to-noise to be still at least 14 dB, so we'll try 4+ miles next and are easily ready for a few contacts during the August/September contest. The contact was made at night, and I believe we can at least make the required 1 km contact during daylight as well. Kerry N6IZW.

LED transmitter construction tips

See Fig. 1 for the transmitter LED VCO and modulator for this system. Construction is dead-bug fashion on a small section of copper circuit board, as the circuit is quite simple. Dead bug infers mounting the chips upside down and holding them to the PC board with a dab of RTV. After the RTV sets, solder the ground pins directly to the copper foil and mount the components in mid-air. If you don't want parts to move, use a dab of RTV to hold in place after soldering to required IC pins — just remember, "A little dab will do ya."

The electret mic is mounted on one side of the rear pipe cap through a hole in the cap, and RTV'd in place. The transmit circuitry is mounted in the rear of the pipe cap assembly. The LED and its mount, a small piece of PC board, are used for positioning in the center of the upper (front) of the pipe cap. When the LED circuit is finished and assembled but not permanently fixed in place, focus the LED and adjust its beam for the center of the Fresnel lens. To be sure it's centered, rotate the lens or LED and the beam should stay centered as best as possible. This is somewhat critical, or else the LED light beam will be skewed coming out of the lens and not point properly to a remote

Additionally, care should be given to cut out the Fresnel lens, which is circular in nature. The lens, when cut out to the diameter

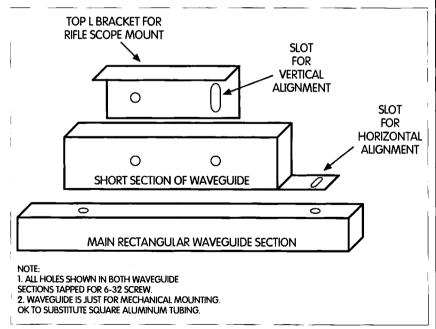


Fig. 3. Method of securing rifle telescopic sight to center rectangular support. Detail shows method of vertical and horizontal easy adjustment of orientation of rifle scope to transmit beam of LED transmitter when reflected off of remote reflector. This reflector should be at least 250 feet away to avoid parallax problems. I used a car's red rear reflector about 5 houses distant for my first trial alignment.

Mobile, Portable and Emergency Operation

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It's That Time of Year

As I write this, I am looking ahead to the start of the hurricane season. As I try to lay out my plans that I may need to rely on, I thought that I'd share them. I'm curious as to how these may compare to how you look at things in your area. While I normally am pretty good at planning, this year is going to tax my ability quite a bit.

n one hand, I'm involved in the disaster services communications world, while on the other hand my daytime job is as director of a department in a hospital. This means that what I plan and put into place may have to work without my being as involved in its execution as I'd like. Therefore, I need to develop as comprehensive a plan as possible. Depending upon the particular situation, I may be operating as net control, or I may be directing a portion of the hospital's activity, and totally out of the communication arena.

Fortunately, with hurricanes, as opposed to many of the other forces of nature, there is a bit of advance warning that we enjoy. The hurricane activity level is forecast months before hurricane season starts. Tropical depressions are monitored as they form hundreds of miles away, to see if they strengthen and to determine their track. We usually expect a fairly long period to watch the system develop or diminish. On the other hand, when dealing with other natural disasters there may be little or no warning. The offset is that while a tornado forms quickly and strikes suddenly, it also dissipates in a short while, whereas a hurricane can continue for quite some time.

Preparatory stage

I break up my plan into several stages, identify my needs, and then try to determine how to best meet those needs. The first stage I call the preparatory stage; it includes all that quiet time when we prefer NOT to think about disasters. During that quiet time, we need to handle such things as the identification of those agencies which will be served and what their needs will be. Once this is determined, it is important to identify who the contacts will be at the served agencies, and who the hams are who will

serve them. These people need to get to know one another so that when the need arises, the communicator will be able to step into the picture and get started with no need for training or familiarization.

Identification badges or cards may be needed to cross police lines or enter a facility. This needs to be handled during the preparatory stage. You need to seek volunteers and let them know their assignments are critical so that they may familiarize themselves with their assigned location. Knowing what services are available in a given facility will tell the amateur radio operator what they will (or won't) need to provide for themselves. A ham assigned to a hospital can expect to have power and water more readily available than one sent to perform damage assessment in the field. On the other hand, the ham assigned to the field may be able to use a handie-talkie or a mobile rig, while the one in the hospital may have problems unless an external antenna is available. These matters can be better planned for, but only if there is an understanding as to the pairing of hams and assignments long before there is a need.

Imminent stage

In the imminent stage, it is recognized that disaster is possible, but it has not yet presented itself. Not every disaster will permit this stage, since an earthquake or an explosion may offer no advance warning. If you do have an awareness of a significant threat, this is the time to activate certain



personnel. If bad weather is brewing, for example, SkyWarn is normally activated. Merely activating a net is not enough, however. The Weather service will need to have their ham on site. Don't expect that this person can handle the SkyWarn Net alone. The bad weather that threatens one area is coming from somewhere else, and that area may also be the responsibility of the same weather station. They may be tracking storms in three or four counties, and their amateur operator may be switching frequencies to communicate with the various weather nets, so a net control station is also needed.

Obviously, some of the public service agencies may want their ham radio operator available and on site. This may be at the communications center that handles the emergency 911 calls, the police department, or the Emergency Operations Center. If emergency shelters are being prepared, it's pretty likely that they will want to have their communicator on site.

Don't forget that while you are providing communications for everyone else, you need to take care of doing the same for yourself. Assign a command frequency so that the communications leaders have a place to compare notes. Make sure that all stations on the frequency know what the secondary frequency will be if the primary repeater frequency is lost.

The demand may be high during the imminent stage, even though there may not be a lot of activity for individual hams. In many cases there may be many hams involved, but the net control station may be

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the only active station. It can be very taxing to be on a heightened state of alert for a long period of time with nothing to do. At this point, everyone wants to get involved and volunteers are plentiful, but it is important to budget your people carefully (more on this later). Incidentally, this "hurry up and wait" period is one reason that a good book is important for your "grab and go" bag!

Disaster stage

Actually, from a communications standpoint, this is the easiest portion of the activity. From almost every other perspective it is the hardest. The need for communications is temporarily at a low point. Unfortunately, the reason there may not be a lot of communications required is because everyone is busy hunkered down in a safe place (hopefully). Don't feel unwanted—this is the communications lull before the storm.

Immediate post-disaster stage

After the disaster occurs, there is a time during which confusion is the main ingredient. It is obvious to everyone that something has happened, but the extent of the event and its effects are unknown. The operators who have been standing by may now be used extensively. The stations that have been standing by may be called upon to provide an overall description of what has happened. Is there power? Phones? If not, where has it been interrupted? If phones are not available, then it falls to us to identify the acute problems that must be addressed. Areas that have sustained damage may not present the major problem, since additional damage may not be a threat. On the other hand, fires, chemical leaks, etc., can and will create larger problems if not addressed, so it is critical that these be identified and addressed as soon as possible.

At this time, there are a couple of actions that might be necessary. Frequency control is critical at this time. I think it is a good idea to assign one operator as the frequency coordinator. Everyone should be aware of the backup repeater and the backup simplex frequency. A frequency coordinator should periodically check in with net control on the main net frequency, and then keep tabs on the other repeaters in the area to determine which are working and can provide coverage for an appropriate area or function. As the demand for communications increases, the frequency coordinator is the person to determine which networks should be on which frequencies. Again, don't forget to reserve one frequency (if possible) for the use of the communicators themselves. This frequency may be useful for assigning hams to their locations, accepting check-ins for hams arriving in the area, etc.

Rescue stage

Once the authorities have sorted out what has happened, the rescue stage begins. At that time, efforts are made to reach and assist those who have been affected by the disaster. We, as communicators, will be directed as to what is expected of us. Our main job in this stage is to respond based on everything we planned for so far. This may include providing cross-communications from one agency to another (e.g., National Guard to local fire department), since they often have totally different radio systems for their internal use. Damage assessment efforts may begin, and we may either be asked to provide communications for the assessment teams, or to perform the assessment ourselves. This stage can be very intense and place a high demand on the hams. You should assess the stations that were active during the imminent stage and determine if they can stand down for a while and be relieved by others, to grab a snack or a nap. While the adrenaline is still flowing at this point, sooner or later people, as well as batteries, need to recharge.

Sustainment stage

This is perhaps the most difficult stage, particularly since it may be the least glamorous. While everyone wants to help out at the very beginning, this desire cools after a while. People begin to drop out of the picture; employers expect their people back on the job. Families are waiting, etc. Hams who responded in the beginning may be experiencing burnout by this point. People who can run on adrenaline and coffee for the first day or two cannot sustain this indefinitely.

For hams, the sustainment stage may present some very real possibilities. There is not only the need for communication for public service agencies and at shelters, but this is the point at which health and welfare traffic becomes important. In today's CNN instant news, World Wide Web, cellular telephone society, not hearing from someone in a disaster area can be even more traumatic than in the past. It is important to have operators who can provide support after things begin to settle back down.

Well, those are some of the ideas I'm working on. How's your plan going? If you have any good ideas to share, drop me a line, a note, etc.

Dr. Rick Olsen N6NR Western Washington DX Club P.O. Box 538 Issaguah WA 98027-0538 [n6nr@arrl.net]

Phoenix and Clipperton

Pretty much half the year has gone by already. It's time to start looking through the log to see if you qualify for any of the new awards that are available. One award I don't want you to forget is the DXCC Millennium Award offered by the ARRL. As you can see from the copy of my own award that I received back in April, it is a handsome certificate, worthy of any shack wall.

This award is not all that difficult to obtain. I am glad too that the folks at League HQ took our lead by offering a DXCC-ishicertificate that embraces the no-QSL spirit of the DX Dynasty Award. I'm just poking fun, of course, which is my twisted way of pointing out that QSLs are not required for this DXCC certificate. All you have to do is send in a log and a "tenspot," and it's yours. Here are the official rules from the ARRL Web page:

- 1) The DXCC 2000 Millennium Award period begins 0000 UTC 1 January, 2000. and ends at 2359 UTC on 31 December, 2000. All contacts must be made during this time period.
- 2) The DXCC 2000 Millennium Award certificate is awarded for working 100 or more of the entities on the ARRL DXCC List. Contacts may consist of any combination of bands or modes.
- 3) No endorsements of any kind are offered. Certificates are dated, but not numbered.
- 4) The applicant must certify on the original application the authenticity of log extract information for contact with the 100 entities on the DXCC List. No QSL cards are required for this award.
- 5) The DXCC 2000 Millennium Award is separate and distinct from the traditional DXCC awards programs. Qualifying for the DXCC 2000 Millennium Award does not provide credits for the traditional DXCC awards programs.
- 6) The DXCC 2000 certificate is available to members and nonmembers.
- 7) Applicable rules of the DXCC program, such as location of stations and conduct, apply to the DXCC 2000 Millennium
- 8) The official application must be used to facilitate processing. Application forms | Photo A. The ARRL DXCC Millennium Award.

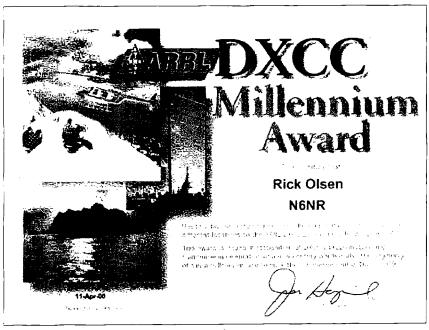
are available for an SASE, or an SASE with 1 IRC for amateurs outside the US. Applications may also be downloaded from the Web. The URL is: [http://www.arrl.org/ awards/dxcc]. Mail requests for applications may be sent to: DXCC 2000 Millennium Applications, American Radio Relay League, 225 Main Street, Newington CT 06111 USA.

9) Send completed application (within one year of the close of the DXCC 2000 Millennium period) to ARRL HQ along with \$10 US to cover costs of printing, postage, and handling. So what are you waiting for? Get busy and start pouring through your log to see if you qualify!

More on the DX Dynasty Award

First off, I have to ask all of you not to send your DX Dynasty award applications to me. The wonderful folks at Never Say Die headquarters feel lonely and underutilized if they don't receive them directly. Besides, they are the ones who have the certificates, not me. As for those of you who sent your applications to me, don't worry, be happy. I have already forwarded them on to New Hampshire.

And as for the DXD entities list that I published back in May, I would appreciate it if all of you would take a look at the list to see if I have gotten everything on the list that should be there. I also want to know if



there are some things on the list that you think shouldn't be there. Keep in mind, though, that the DX Dynasty Award has entity inclusion criteria that differ from that set in place for DXCC, and others. The DXCC countries list is intended to be included as a subset, however.

The Central Arizona DX Association Reunion

I can't believe that it has been over 25 years since the formation of the "Arizona DX Ring." This was a group of Phoenix area DXers that kept a list of each other's DXCC needs, and would give a call to anyone on the list who needed a county that they were listening to, with information on band, mode, and depth of pileup. This was the prototype of the DX cluster, and later became a formal organization that is now known as the Central Arizona DX Association.

I recently received a notice from Bob K7BHM that a reunion of the charter members of the CADXA is going to be held in September. Here is a brief synopsis of the early days of the CADXA that Bob sent to me.

"It was in the early to mid-summer of 1974 that a small group of radio amateurs, most of whom lived in the east Phoenix valley, decided to combine for their special interest, DXing, and formed a DX Association. Several of these DXers were members. or had attended meetings of the Arizona DX Club, but found that those meetings were not really satisfying basic DX needs. That club was made up of many 'old-timers,' who oftentimes wanted only to socialize rather than discuss DX. The original sixteen members of this new DX Association, which was appropriately named the Central Arizona DX Association [to distinguish itself from the (Arizona DX Club)], included:

"Wayne W7RUK (W7QS/NN6R); Jerry W7CKW; Ron K7NXH (N7RR) (SK) (the originator, and considered the founder of CADX); Tom WA7VGX (KE7QK); Al K7PFU (W7XA); Dale W7ATF; Chuck WA7RKR (KD6VS); Warren WØSlP/7 (K7SA); Bob K7BHM; Bob K7NWB (K2KXG); Allan WA7YRP (N7RP); Mike K7QYY; Mike WA7HRE (N7MW); Rick, WA7CNP (N6NR); WA7RRR; and WA7YNV.

"Because this group of amateurs lived relatively close to each other in the East Valley (Scottsdale, Mesa, Tempe and Chandler), for the first several months of late 1974 and early 1975, they alternated meeting at each other's QTHs. As the club grew in number, however, it was necessary to locate a permanent meeting place. The old Sands Hotel on East Van Buren in Phoenix was selected as the first meeting location, primarily because one of the members' (WA7CNP/N6NR) father was the CFO for the owner of the Hotel, and we had a great deal for access to the meeting rooms. We started meeting at the Sands in May/June 1975.

"In November and December of 1974, the need for a constitution was determined to be necessary, not only to help formally establish the CADXA, but also to become affiliated with ARRL. The constitution was completed with the help of several CADXA members, and was officially published and released on January 1, 1975. This date is considered our Charter Member date, as well as the anniversary date. It is important to state here the original purpose of the CADXA.

"The purpose of this group is to bring together radio amateurs interested in DX; to promote this common interest through mutual assistance, coordination, and cooperation for all members to achieve DX; to

encourage and assist proper operating techniques, ethics, and standards; and to participate in the exchange of knowledge, methods, or other expedients that would be mutually beneficial to the members in achieving DX accomplishments.

"Charter membership was also established by Article II, Section 3, of the bylaws: 'Those persons attending the January, 1975, meeting in person, or by proxy, shall be deemed to be Charter Members.'

"Full membership would be granted upon payment of dues, which was \$.50 per month, and formal, written acceptance of the Code of Ethics of this club.

"One of the first items on the agenda for the CADXA in late 1974 was the election of officers. At the November meeting, it was unanimously agreed that Wayne W7RUK (W7QS/NN6R) would be our first president. Early records do not exist, but it is strongly believed that the Vice President selected was Al K7PFU (W7XA). Our Secretary/Treasurer was Chuck WA7RKR (KD6VS)."

There is much more to this story, and to hear it, you'll have to attend the reunion in person. It will be conducted as part of the regular meeting of the Central Arizona DX Association on September 7 of this year. For those of you who are familiar with the area, it will be held at the PARA Club in Tempe. Anyone interested in attending, please contact Bob Davies K7BHM, CADXA Historian, at (480)839-3728, or via E-mail at [bdavies@sīamipec.com]. I'll have another reminder next month.

Clipperton 2000

With all the hoopla over the recent DXpeditions to the new countries that have challenged us in the first half of this year, I was afraid that we would soon forget the most excellent operation by the folks who planned and manned FOØAAA. So I took a trip on the Internet to the Clipperton 2000 Web page that is maintained by Doug N6RT. and found a wealth of information on this successful outing [http://www.qsl.net/ clipperton2000]. These guys did a marvelous job of getting all us randy DXers into the log. Speaking of logs, just have a look at the size of the first batch that arrived at the post office after the guys got home. If you think that a DXpedition is all fun and games, just remember the old police officer's maxim that goes, "You're not done until the paperwork has been completed," or words to that effect.

Just to give a flavor for what the team experienced, here are some excerpts from the story entitled CLIPPERTON 2000 — THE STORY, by Mike Goode N9NS [(c)

Central Arizona DX Association



N7KJ – 6545 East Montgomery Rd Cave Creek, Arizona 85331

Photo B. The emblem of the Central Arizona DX Association.

2000, Mike Goode] that is included on the Clipperton 2000 Web page.

"Finally, at dawn on Tuesday, February 29th, Leap Year Day, we sighted our destination. 'Sighted' is hardly the proper word, as the island is so flat all we could make out were several groups of palm trees that appeared to be growing out of the water, and Clipperton Rock, which loomed darkly on the horizon. As everyone was on deck straining their eyes to see details on the small island, the captain cruised around to the west side, trying to find a spot he knew was suitable for landing. It should be noted the Shogun and its crew were no strangers to this place as they go to Clipperton once or twice every year on fishing charters. Also, it was the ship NASA chartered in 1996 as their support ship during a 6-week scientific trip to the island. By 9:00 a.m., the captain had found a spot and sent two crewmen in a launch to check things out. They were not happy with the landing conditions, the surf being rather rough, so it was decided to cruise around to the east side to see if the conditions were any better. So with all of us waiting impatiently we circled the island. We cruised about a half-mile offshore, which gave us a good look at various features like Clipperton Rock, two wrecked Mexican fishing boats, and the small shack at the NASA site. Everywhere around the island there were huge waves crashing onto the reef! Sometimes they raised so high as to obscure the island, and when they broke they sent clouds of spray soaring downwind. The sight of these waves and the mist blowing across the island was sobering to us, to say the least.

"We were beginning to have second thoughts about whether this trip was a good idea! We were committed to it though, so eventually after the ship had circled around to the original landing spot, the captain announced we were going in here. So at 1:20 p.m. local time (we stayed on California time, PST), with life jackets donned and a weak grin on their faces, James 9V1YC, Willy HB9AHL, and Bob K4UEE jumped into the Zodiac. With Bruce, the ship's cocaptain, piloting, they were off! As the rest of us watched anxiously from the ship they approached the reef and then disappeared briefly as a wave built up behind them.

"Moments later, they popped back into view, dry and nearing the beach! We all sighed in relief to see that the landings could be accomplished safely. I was on the third trip in, and what a thrill it was to approach the reef and watch the waves build up and then crash down. How would we ever get through that I asked myself. It was quite a

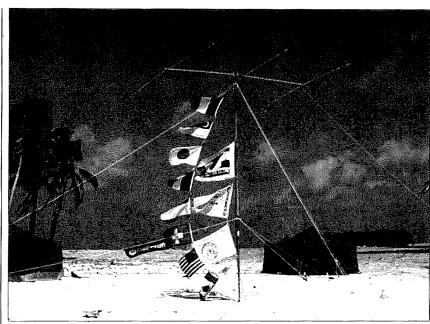


Photo C. I wouldn't say that this photograph will surpass the victory on Iwo Jima, but I predict that it will be remembered in the DX Hall of Fame.

ride — a quick rush on top of the wave, then boom! We dropped down onto the reef, as Bruce skillfully brought the launch up to the beach through a small gap in the reef. It sounds easy, but as we found later, it wasn't always that way!

"Within an hour, we had some of our gear and six members on the island. Now a new menace appeared in the form of a line of dark ominous-looking clouds approaching from the east. Our worst fears were realized, when a few minutes later the wind picked up and sheets of rain began falling. As we struggled to put the first tent up, the wind and rain intensified. The intensity of these tropical squalls can't be described —



Photo D. I've always wanted to go out on a rare DXpedition, but after one look at the pile of QSLs that comes in, I'm not so sure.



Photo E. Miller time for one of the local inhabitants.

they must be experienced to be believed. Visualize yourself standing in front of an open fire hydrant. For the next hour, the six of us endured periods of intense rain and near hurricane-force wind. The rain at times struck us so hard that the drops stung — we thought it must be hail! It was all we could do to hold on to the tent so it wouldn't blow away. What a welcome!

"Finally, at about 3:30 the clouds parted, the wind dropped and we were able to resume the landing operations. By dark, everyone was ashore, and about half our gear was piled up on the beach. Two campsites, about 1150 feet apart, had been selected, and we had set up two tents with cots for sleeping. At dark, about 7:00, we had our first

equipment failure. We had hauled one generator to the island, and when we fired it up, it ran about five minutes and died. We had four 5-kilowatt main generators and a smaller backup, so we had to use our 'backup' generator from the start. Everyone was exhausted, so we crashed early, with the plan of starting assembly of the camp and antennas at first light (about 5:30 a.m.). I have camped a lot, and under difficult conditions at times, and I must say that this was probably the worst night in my life. We were lying uncomfortably on army cots with no blankets or pillows. Many of us, including myself, had not gotten our personal gear onto the island, so we hadn't washed or changed into dry clothes. So I was wet,

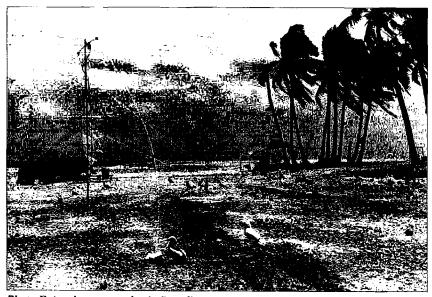


Photo F. Another stormy day in Paradise.
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uncomfortable and freezing cold all night as the wind was blowing briskly through the tents. Add to this all the crabs crawling about beneath the cots, (let your arm drop off the cot and within a few minutes they were nibbling on your fingers) and the constant honking of all the birds outside — Well, you get the picture. Few of us slept at all, and when I got up around 5:00, I found James, Mark, and a couple others already outside assembling an A3 beam in the gray light before sunrise! Before long, we were all up and busy. What an interesting experience it was trying to set up antennas and tents that morning! The birds are particularly active at sunrise, and we had to shout at each other to be heard over the cacophony of noise. The combination of the bright orange land crabs crawling around everywhere on the otherwise barren landscape added to the screeching of thousands of birds made an almost surreal setting. I kept asking myself. 'Is this really happening or am 1 dreaming?'

"To continue, by midafternoon we had tents, radios, antennas, and generators all assembled at both sites and were ready to go. We assembled about 4:00 p.m. at the SSB site where John was to make the symbolic first contact. He picked 20 meters, 14.195 as a starting point and whose melodious voice did we hear on that frequency but good old V31JP 'Joe Palooka' (K8JP) talking to none other than Pete NØFW. Now the irony of this is that Pete was one of the organizers of the 1992 trip and held the license FOØCI. So John broke in and put Pete in the log as the first QSO for FOØAAA, and V31JP was the second. And more ironic, on the 1992 trip after our first QSO, which was with a KL7, Joe K8JP broke in on us and was the second QSO for that Clipperton DXpedition as well! That guy just will not leave us alone! After those QSOs, which were logged at about 0015Z on March 2nd. the band exploded and John handed the mike to Eddie EA3NY, then covered his ears laughing as we all scattered to take up an operating position. Doug VE5RA took over the second SSB station, opening up on 12 meters where he made 677 QSOs on his first 3-hour shift. There was a mad rush down to the CW tent with James 9V1YC and Mark ON4WW running the fastest so that they could become the first operators on CW. Also, in the SSB tent, we set up the RTTY station, with Doug N6TQS doing all the operating, and a 6-meter station with Koji JK7TKE doing most of the work. Eventually, we set up a third CW station to give us an extra station for low band work at night.

"Here's the equipment list. SSB site,

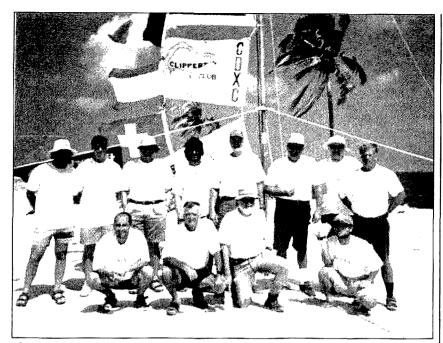


Photo G. We survived Clipperton Island.

radios: 4 Icom IC-756PROs (courtesy Icom), 2 for HF SSB, 1 for six meters, and 1 for RTTY. Antennas: 1 A3WS (courtesy Cushcraft), 1 A3S (courtesy Cushcraft), 1 Cushcraft MA5B minibeam used exclusively on RTTY (courtesy Cushcraft), 1 6m beam (courtesy M2), 1 Butternut HF9V, 1 K9AY inverted L for 75m. CW site, radios: 2 Icom IC-756PROs (courtesy Icom), 1 Kenwood TS-850. Antennas: 1 A3WS, 1 A3S, I Battle Creek Special used on 160m, 1 single HF2V for 40m (no 4 square) (courtesy WØGJ), 1 inverted L for 80m in coconut tree (courtesy ON4WW), 1 receiving antenna (like a combo K9AY, EWE, and Pennant, computer enhanced by K6SE), built by ON4WW.

"For the next several days, it seemed all we did was operate and sleep, operate and sleep, with an occasional meal thrown in. After spending the first two days on the island setting up with practically no sleep, all of us were very tired, so were hitting the sack every chance we got. I had the additional assignment of seeing that the generators were fueled up. So often in between operating shifts I was hauling gasoline between camps and feeding generators. James arranged shifts so we sometimes had two in a row, and I often ended up with one on CW and the second on SSB, usually late at night. So I would haul empty gasoline cans over to the SSB site, where I filled them and hauled them back when my shift was over. This was particularly challenging at night with only a small flashlight for guidance, as it was kind of tricky finding a smooth path for the cart. The route had to cross both soft sand and rough coral, not to mention dodging dozens of sleeping birds. Several times I was stumbling along half asleep and ran into one which rudely jolted me wide awake with loud squawking and a peck on the leg! ...

"We had to depart the island the afternoon of Wednesday, March 8th. We anticipated it would be slow and difficult to get off the island, so in order to be sure we could get away in time, we started breaking camp at daybreak on the 7th. We intended to remove all but the bare essentials necessary to keep some stations going into the next day. Everything but the tents, antennas, and one generator were taken down and hauled to the landing site. This took until midafternoon, so FOØAAA was off the air for about ten hours that day. That night I think everyone felt both sad that it was over and happy that we were leaving. I suspect if given a choice, we all would have voted to stay two or three more days. That night, we decided to shut down for good at 10:00 a.m., or 1800Z, the next day. As the hour approached, we all gathered around the SSB tent to watch John make the last QSO. As for the first OSO he chose 20 meters, but had to tune around a bit to find a clear spot, ending up near the IOTA hangout of 14,260, where he found a station on Revilla Gigedo Island — XF4LWY. A fitting end perhaps, one rare island talking to another we thought, as John broke a pileup for the last FOØAAA contact.

"At 9:00 a.m., the Shogun pulled up to its berth at Fisherman's Landing. Now the adventure really was over. All that remained was to unload the ship, and then shake hands one more time as each member departed for home.

"We were all tired and glad it was all over. The excitement, the victories, and hardships were all behind us. Then came the question that is always asked — Was it worth it? With over 75,000 QSOs in the log, the answer has to be a resounding YES. We went there to put Clipperton Island in as many hams' logs as possible. I think we succeeded. Now, on to the next one ... 73, Mike N9NS."

That is only a sample of the great story that Mike has left for all of us on the Web page. I hope that you point your browser in that direction; and if you happened to work them, perhaps you will reflect a bit about what it must have been like at the other end of all the clamoring that was spread about the ham bands during this fine DXpedition. So hats off to Eddie EA3NY, Mike N9NS, Willy HB9AHL, Jim N9TK, Koji JK7TKE, Charlie NØTT, Bob K7UEE, Mark ON4WW, Doug N6TQS, John N7CQQ, Jim 9V1YC, and everyone else who make this effort a successful one.

Pulling the big switch

My apologies to all for the misspelling of TXØDX in last month's column. I'll "ride heard" on the publisher a little harder next time.

So much for this month's offering. I look forward to hearing from all of you very soon, so ... 73 and good DX!

WANTED

Fun, easy-to-build projects for publication in 73.

For more info, write to:

Joyce Sawtelle,

73 Amateur Radio Today.

73 Amateur Radio Today, 70 Hancock Road Peterborough NH 03458.



NEW PRODUCTS



Universal Super Catalog

Universal Radio has just come out with their newest catalog, which is cram-packed with good deals on everything from ARS transceivers to connectors to books to SWL stuff to flashlights to ... well, you name it. 106 pages of fun and bargains would be a good way to describe it.

That's the good news. The bad news is that it has a \$2 cover price. BUT the really good news is that most catalogs like this that we've seen go for \$10 or more. AND the really, really good news is that it is FREE for the asking to 73 readers (well, to others as well, we suppose).

To order yours, contact Universal Radio, 6830 Americana Pkwy. Reynoldsburg OH 43068; (800) 431-3939; [www.universal-radio.com].



Paddlette K-4 lambic Keyer

Housed in a tiny black box (3/4 x 1-1/2 x 2 inches) and weighing just one ounce, the K-4 will operate for four years on its self-contained lithium coin cell. Basically, it generates strings of dits and dahs

in response to paddle strokes, as well as provides 12 keying options to the user: speed adjust, tune, paddle select, sidetone on/off, straight key mode, iambic mode A/B, beacon, enter message #1, enter message #2, play back message #1, play back message #2, and iambic keyer mode.

The TicK-4 CMOS keyer IC also includes nonvolatile memory for speed, mode, paddle select, and sidetone on/off. \$48.95 + \$2.25 s/h.

For further information, contact Paddlette Company, P.O. Box 6036. Edmonds WA 98026; (425) 743-1429; [bham379627@aol.com].

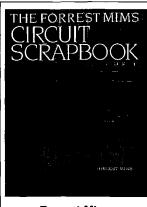


Gordon West Updates

WB6NOA has announced the completion of his three new and up-to-date license manuals for Element 2 Technician Class, Element 3 General Class, and Element 4 Extra Class. Also new is his six-tape code cassette course, specifically recorded for the 5 wpm Element 1 exam.

The new Tech book, valid through June 30, 2003, covers all 394 questions, plus West's description of the correct answers. The General manual is 160 pages and valid through June 30, 2004; it includes a special 16-page pullout section that focuses on recent changes in General licensing requirements. The Extra book is a whopping 240 pages and good through June 30, 2002; it contains all 676 questions in the exam pool.

For more information. contact Gordon West WB6NOA, Radio School, Inc., 2414 College Drive, Costa Mesa CA 92626; (714) 434-0666; (714) 549-5000 10-4 p.m.



Forrest Mims Circuit Scrapbook II

This is the second volume of the book mentioned in this space last month. It's a collection of some of Mims' best work from Modern Electronics, showing how to build and experiment with: audio synthesizers, data loggers, fiber optic sensors, laser diode devices, MOSFET oscillators, piezoelectronics, power supplies, pulse generators, radio control systems, and much more.

Each circuit includes a schematic, detailed theory of operation, construction hints, and other useful information. \$24.95.

For further information, contact LLH Technology Publishing, 3578 Old Rail Road, Eagle Rock VA 24085; (540) 567-2000; fax (540) 567-2539; [carol@LLH-Publishing.com].

New Hamcalc CD-ROM

Hamcalc Version 43 has just been released by its guru, VE3ERP. It contains many new programs and upgrades, compiled into a collection of over 250 painless math and design programs for radio amateurs and professionals. Most programs can be run in either metric or imperial/USA units. Contains much info not found in current amateur handbooks and literature, and is easy to use for nontechnical hobbyists.

For a free Hamcalc MS-DOS/Windows CD-ROM, send \$7 shipping and handling to George Murphy VE3ERP, 77 McKenzie St.. Orillia ON L3V 6A6, Canada; [ve3crp@encode.com].

WinCw by Electrosoft

Electrosoft has introduced a Windows-based Morse code sending program that works under Win 3.1. 95, and 98. The program offers a large type-ahead buffer (100 characters) with visual display; 10 preprogrammable F-key memories where you can store up to 100 characters each; a repeat message function with timer setting; adjustable sending speed from 5–99 wpm; sidetone on/off; tune transmitter on/off; send on serial port com1 or com2; and wired RS232 interface cable to connect your computer to your rig. \$25.

For more information or to order, contact Stephen Stuntz NØBF, Electrosoft, P.O. Box 1462, Loveland CO 80539; [n0bf@juno.com].

Digital Satellite Communications

Since the beginning of the year we have investigated what it takes to make contact via the "easysats" using portable, mobile, and home stations. With the launch of the largest, most powerful amateur-radio satellite, Phase 3D, only months away, it's time to take a look at basic digital satellite communications.

Phase 3D carries a wide array of transponders for voice and CW, but it also has digital communications systems, as do a growing number of low-earth-orbit hamsats.

Packet

Most hams think of packet radio when digital ham communications is mentioned. This is caused by the wide proliferation of inexpensive TNCs (terminal node controllers) that can be purchased from any ham dealer. Typical packet operation is accomplished by connecting the TNC to a PC and the mic and speaker connections of a twometer FM transceiver. The data-communications speed is usually only 1200 band, This can get rather tedious for those that have experienced high-speed Internet connectivity using DSL or cable modems. Why bother?

There is a constant search for useful packet-radio applications. Some of the more interesting uses have included packet E-mail, telemetry reporting, file transfer, DX clusters, satellite store-and-forward operations, and APRS.

APRS

APRS (Automatic Packet Reporting System) was developed by Bob Bruninga WB4APR to track location data in near-real time. With a small GPS (Global Positioning System) receiver, and APRS software [http://www.tapr.org], the portable packet station can be set up to automatically send beacons containing latitude and longitude information and short messages. It's a quick and effective way to report the location of a car, boat, balloon, or the lead bike in a race.

Most APRS data is sent via digital repeaters, or digipeaters. A lot of this data finds its way to Internet sites that show maps of

station locations by callsign and type [http:// www.aprs.net]. Special icons on the maps denote portable, stationary, and mobile

At the AMSAT 16th Space Symposium and Annual Meeting in October 1998, Bob WB4APR proposed TRACKNET, an AMSAT mobile satellite system. Bob suggested the use of current under-utilized 1200-baud packet hamsats for APRS digipeating. Some of the hamsats in Bob's plan included AMSAT-OSCAR-16. LUSAT-OSCAR-19, and ITAMSAT- OS-CAR-26.

Due to the satellite hardware configuration, the mobile ground units would require minor TNC circuit modifications to transmit, but would not be able to monitor the satellite downlink. The uplink to these pacsats is Manchester-encoded two-meter FM, while the downlink requires 70-cm SSB reception, frequency tracking, and more interface electronics. A few stationary gateway stations would be set to collect downlink data and forward it to the Internet.

The system works, but there are not many participants. The tests through the packet system on Mir in early 1998 were more popular. The Mir system simply acted as a digipeater for APRS packets on a simplex, two-meter-FM frequency. No TNC or radio modifications were required. Any station that could transmit standard APRS packets could also monitor the activity via the Mir downlink.

SUNSAT

SUNSAT-OSCAR-35 was launched on February 23, 1999, on a Boeing Delta II rocket from Vandenberg Air Force Base in California. SUNSAT is a relatively complex satellite designed and built at the University of Stellenbosch in South Africa. In addition to many experiments and payloads for educational programs, this satellite carries a mix of voice and digital amateur-radio systems. The various frequency-agile transponders can be programmed to activate in either mode at specific times.

Bob WB4APR and Johann Lochner ZR1CBC, the SO-35 Control Operator, began a series of experiments earlier this year for packet tests over North America. Unlike the other pacsats, SO-35 typically operates at 9600 baud and can support packet digipeating without interrupting normal downlink data, like the images that SO-35's onboard cameras take. There were some coordination and scheduling glitches, but these tests were very preliminary. Announcements were only sent to those that subscribed to the "aprssat" remailer via [http://www.tapr.org]. For most of the tests, the downlink was on 145.825 MHz with a corresponding uplink of 436.290 MHz.

One goal of the tests was to determine the effectiveness of 9600-baud portable and mobile APRS stations using simple omnidirectional antennas and moderate power via satellite. Thanks to some new radios from Kenwood, the experiments were a success; they will provide direction for future tests, and perhaps an APRS hamsat.

New radios

If you have seen any Kenwood advertisements in the last year, you have seen their dual-band HT, the TH-D7, and their new mobile dual-band transceiver, the TM-D700. Both radios can operate full-duplex crossband FM voice for satellite communications via AMRAD- OSCAR-27, UoSAT-OSCAR-14, and SO-35, and they can also be used for certain types of digital operation via satellite.

Both radios can be used for standard 1200and 9600-baud packet and APRS on either two meters or 70 cm. The TM-D700 however, has a better TNC that can be configured for KISS mode (overrides standard TNC commands) thus allowing raw data reception, necessary for typical 9600-baud pacsat operation. Both rigs are constrained to a minimum 5-kHz tuning increment, but for FM work, this is sufficient for typical Doppler correction. The TH-D7 HT does not support full-duplex, crossband packet or full-duplex, crossband APRS. The TM-D700 will do KISS and fullduplex, crossband packet, but it will not easily support full-duplex, crossband APRS. Several stations though have successfully

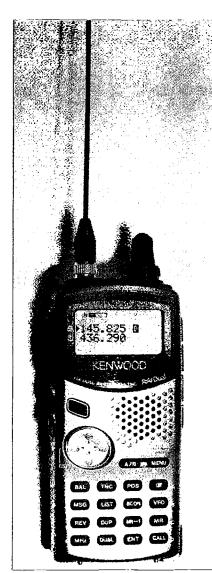


Photo A. The Kenwood TH-D7 HT has built-in 1200 and 9600-baud packet with APRS support. A long dual-band antenna makes it useful for pacsat work or crossband voice operation.

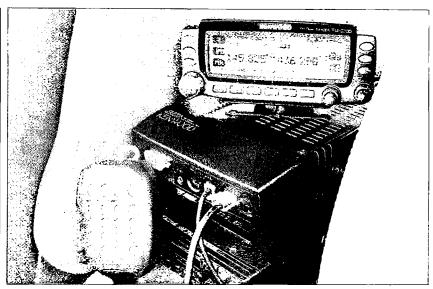


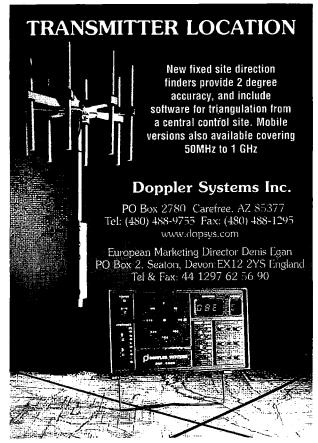
Photo B. The Kenwood TM-D700 mobile radio can do stand-alone APRS transmission and reception from liamsats that support digipeat operation in addition to other pacsat and voice-satellite activity.

used either radio for the SO-35 tests. Bob WB4APR has devised several methods to circumvent the deficiencies.

If you are looking for a digital home sat-

ellite station for the current and future pacsats, rigs like the Yaesu FT-847 still provide the best core radio choice, but if your interests lean more toward portable and mobile activity, the new Kenwoods are worth a serious look. A TM-D700 can be configured to transmit and receive 9600-baud APRS data via satellite without any additional computers. TNCs, or other gear. For tips on setting up a TM-D700 for pacsat work, refer to the material at [http://web.usna. navy.mil/~bruninga/ astars.html]. Books on APRS can be found at [http:// www.arrl.org].

Digital satellite communications are going to higher speeds and more complex formats. The best way to get started is to try off-theshelf radios, software, and TNCs that can get you on the air while at the same time providing insight for future experiments.



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Inside MixW32

I have seen several notes from hams on my PSK31 monitor that MixW32 was their program of choice. Some claimed it to be the best there is. Well, you never know until you try, so I downloaded the demo file.

There are so many freebies out there already, it is difficult to make a hit with a shareware program unless it really works. And this program really works!

However (you know there will be a catch when I toss in that word), I started out a bit disenchanted. The very first impression was that it received and printed the warbling mode very well. Good so far, but how to transmit? There is no transmit "button" on the screen. I thought I had tried all the hot-key combinations, but I was to learn I missed one, albeit the one not likely to be used.

There was also another missing ingredient: no obvious pull-down Help file. I was lost. Did the folks who were selling this program feel a demo was something you only copied with? No — they are a whole lot smarter than that. This was merely the beginning of a "learning moment."

Next stop, I gathered up notes from the readme file and sent an E-mail to Jim WA2VOS with the appropriate questions. It didn't take long to find there are two ways to toggle the transmit mode. The easiest is to use the "Pause" key. Bingo. I was in business.

Incidentally, on the day I was readying this article for the mail, I ran across Jim on PSK and snapped the accompanying screen shot. It had to happen — the conditions were such that the S-meters on either end were seldom moving. Of course, that again demonstrates the nearly unbelievable capability of PSK31 to get through where "mere mortal modes" fail so miserably. (See Fig. 1.)

With the help of keyboard dexterity, I made a RTTY contact and got back a very good report on signal quality. I didn't tell you this program had more than one mode. did I? More about that later. And I hadn't made any real changes in setting the audio drive since using the last soundcard program. MixW32 just plugged and played.

Next, it was time to give the PSK31 a try. Same group of problems here as with RTTY. There seemed to be no macros available, so CQ was manual as well as BTU turnovers, plus I sorely miss it when I don't have an operating PTT circuit. Well, I have gotten used to that as I try different programs.

It was E-mail time again. The program was obviously a winner in the quality of sent and decoded signals. Now I wanted to know how to get the rest of it working. Back to the E-mail. Jim solved most of the problems by sending the help file, which I printed immediately. There was all the information I ever wanted, including how to pop up the help files. How could I be so dumb? A very normal Alt+H is all that is necessary.

In the process of problem-solving, Jim had forwarded my E-mail request to the author, Nick UT2UZ, and he wrote back that my cable hookup for Logger would work just fine if I entered the correct information into the "Setup" screen. Here again, I had missed. Nick also uses an Icom 735 and he made sure all the rest of us could use the same radio by use of a few choices in pull-down menus in the Setup.

Once I started following directions it all fell into place. There are over 30 definable macros. I used four. I am easy to please. The CQ macro is edited separately with its own hot-key screen. It is self-repeating, and the interval between calls can be edited on the same screen. CQ is initiated by Alt+A. The oft-used macros would be initiated by simply pressing the function keys. Then there are other combinations when you wish to make a more complex set of macros.

After using the program for a week or two, I became pretty familiar with its ability to "grab" calls and allow the macros to use them. That is, when I want to return a station's CQ, usually the call is ready and the exchange automatically includes that

call when I press the function key for the macro. If not, you could say the program senses confusion and asks what call to insert, and generally suggests the last one it recorded. Makes it very easy once you are used to it.

The first few contacts (before help file) were made by tuning with a waterfall display that seemed to tax my patience. That was a negative I wasn't certain I could live with for very long. Then I found the program provides a choice of three tuning indicators. The one I prefer shows two spectral lines and (I think) is a great improvement over the waterfall. (See **Fig. 1**.)

Back to other modes. You recall I mentioned RTTY. You can tell when a ham who enjoys RTTY has written the software. This program utilizes the same AFC and NET tuning/tracking for RTTY as it does for PSK31. In other words, the soundcard will follow any drift it detects in the received signal, and then, when you switch to transmit, you are "zero-beat" with the other station.

Nick made it easy for you to switch between normal and reverse tones with a button. You can work RTTY without having to think your way through every move. This is what is referred to in the modern vernacular as intuitive.

It also does CW as well as any program I have tried and better than many. Copying CW with most software includes decoding in your head in order not to miss the important parts. I didn't listen to CW for a long while, but what I saw was impressive. It sends okay, but that is a little less problem. Anyway, a CW QSO looks to be as simple as cabling up and going for it. Cabling is the same as for the other modes.

The surprise to me was packet. I tuned to one of the HF packet frequencies, poked the packet button, and surprise me! It copied a sample of HF packet. The program sends

and receives packet with no complex manipulative extra software or modems. Pretty fantastic!

Then I saw a little button on the screen amongst the other "click-to-play" icons that is labeled Pactor. This was just too good to be true. However, it only does the "Listen" mode in Pactor, but it does that just like it does everything else with AFC and prints on the screen what it hears. Sometimes it looks perfect. Other times it looks like the typical Listen mode in that the signal isn't good enough to decode without numerous resend packets.

There is another mode, MTTY, that I have not tried as of this writing, but, even though it is experimental and only works with this software at both ends, I have heard favorable comments. Just a little added feature. all at the same price. Speaking of price, the cost of the registered package is about \$50 if you will accept it via download. On disk, there is another \$10, and this includes a printed documentation.

And you get more yet. The program includes a logging module that you can hold accountable for various awards. It works a little differently than other such programs,

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Fig. 1. Screenshot. As luck would have it, I found Jim WA2VOS on PSK31 the day I was readying to send this to the magazine. Conditions were at low tide. The copy at his end was worse, but with no wiggles on the S-meter, this is what it looked like. Several unique features of the program include a selectable tuning display. You can use the familiar waterfall or two other options. I opted for the spectral display. It takes a bit to get used to, but it works very well. Note the diamond above the depression between two humps. You can carefully tune your rig to center the diamond, or simply click in the depression and you are right on. There are two traces. If the magazine print allows, you can see a light colored hump above the depression. When the tuning knob is not being twisted, you can use the various humps across the display to locate other signals. The world display to the right gives the beam pointing automatically calculated by the program. The buttons on the right give some idea of the capabilities of the program. (See text for details.) There are several screens. At the top, below the title boxes, are the automated log entries. When you click the "Save" in the lower left, they will fill with the info from the current QSO, and editing is allowed. Below that, the large area is obviously for sent and received text. The next text area is the transmit buffer screen. Type-ahead is allowed. The callsigns displayed are from a macro I use that picks up the other station's call and adds mine. One function key and I have the start of the text for my return. Then I can type ahead while he is transmitting and dump it on him when he turns it over. Makes me look like a typist. The screen below that is where the program had "grabbed" the call during a CQ. From there, my macros can use the call for calling, BTU phrases, etc. The blank line can be automatically or manually entered with log information before you click the Save. This is an unregistered download, so you can see it is possible to thoroughly evaluate the program before you spring with the bucks.

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and that is because the author wanted to do it his own fast and easy way.

After I got MixW32 fairly well under my belt. I made contact over the air with other users. It was interesting to see their reactions to the program. Their experiences mirrored my own to one extent or another. The demo program, which is the first thing most of us see, is lacking in basic instruction. I think most of what I refer to as new-userangst could be alleviated by letting the secret out that the answers to most questions can be found with some study of the built-in help file (Alt+H, for anyone who forgot). This is a program well worth a try. The demo is available at [http://tav.kiev.ua/~nick/ my_ham_soft.htm].

In other news. Very likely, by the time this column is in print, the new-age PSK31 program from Bob Furzer will be in a lot of computers. Bob has decided to separate the logging program from the PSK31 program, so there will be Logger and Zakanaka (no, I don't know why, but it is the name of the standalone PSK31 software) as separate programs.

Web address (URL): Source for: Soundcard program for PSK31, http://tav.kiev.ua/~nick/my_ham_soft.htm RTTY, more TrueTTY - Sound card RTTY w/ www.dxsoft.com/mitrtty.htm PSK31 Pasokon SSTV programs & hardware www.ultranet.com/~sstv/lite.html PSK31 — Free — orig. PSK31 http://aintel.bi.ehu.es/psk31.html also Logger Site with links to PSK31 and Logger www.mysite.com/k5fq 6.12 PSKGNR — Front end for PSK31 www.al-williams.com/wd5gnr/pskgnr.htm Digipan- PSK31 - easy to use http://members.home.com/hteller/digipan/ Scope program by Bob Furzer www.chroniclenetworks.com/~dwm/Logger.htm TAPR — Lots of info www.tapr.org TNC to radio wiring help http://freeweb.pdq.net/medcalf/ztx/ ChromaPIX and ChromaSound DSP www.slliconpixels.com software Timewave DSP & AEA products www.timewave.com Auto tuner and other kits www.ldgelectronics.com XPWare - TNC software with www.goodnet.com/~gjohnson/ sample DL RCKRtty Windows program with free http://home.t-online.de/home/dl4rck/ [use lowercase DL4RCK] HF serial modem plans & RTTY & http://home.att.net/~k7szl/ Pactor SV2AGW free Win95 programs www.forthnet.gr/sv2agw/ Source for BayPac BP-2M & APRS www.tigertronics.com/ BayCom — German site www.baycom.de/ BayCom 1.5 and Manual.zip in www.cs.wvu.edu/~acm/gopher/Software/baycom/ English N1RCT site - excellent RTTY ref. http://www.megalink.net/~n1rct/ Int'l Visual Communication Assn. www.mindspring.com/~sstv/ nonprofit org. dedicated to SSTV Creative Services Software www.cssincorp.com Hellschreiber & MT63 www.freeweb.org/varie/ninopo/iz8bly/index.htm Table 1. The "goodies" list.

This transition looked as though it might have stalled for a time, as new help files were having to be written, and volunteer writers were at a premium (rare as hen's teeth). On the air, however, I overheard one ham say that he was writing help files for the new program and I conversed with another ham who was also doing some of the volunteer work.

I saw a screenshot of the new program on the Web, but that will surely all change by the time this hits print. So, if you can't find it with a search engine, let me know. I will probably have the correct URL if I keep my ear to the ground.

The Icom 756PRO found its way to the hinterlands of Carson City and it makes some real differences. The main reason for the purchase is the DSP IF filters. The second and top reason is the wife let me do it. Couldn't have happened otherwise. More on this new piece of furniture at a later date.

The point I wish to make at the time is that once I got down to the nitty-gritty and followed the setup on the radio to ensure that it would speak to the computer, and made a few minor adjustments to the program, a whole new era of communication is about to spring forth. I can turn the dial, and the readout on the Logger program follows just like one would expect. So, I will stop degrading the program for not listening. It simply needed more tuneful music to listen to.

What it all boils down to is that some radios do and some don't cooperate as well as others. I really don't know how many are in each category and it is not worth compiling. You know if yours works. There are various interfaces available for most radios. as well as different software. You have to find what works for you.

Speaking of radio control, I ran across several items lately that may capture your imagination. While I was gathering information on Icom from their Web page, I ran across reference to control programs. Naturally, since the company is in the business of building the hardware, they have some software listed.

I have mentioned the problem of getting Logger to poll the Icom 735 for current frequency readouts. At the time, I was not in the market, but I checked to see what was working for the IC-735. Not much from the parent company, but there was a link I followed to a logging program with control capability. It is YPLOG by VE6YP. It can viewed at [http://www.nucleus.com/~field/Icom. html]. It can be downloaded to experiment

Low Power Operation

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The MFJ Cub QRP Transceiver

Over the last several years, the QRP community sure has seen a slew of new QRP transceivers. Gone are the days of crystal control and direct conversion receivers. Today, we have cutting edge technology that would have been unimaginable just a few years ago. But sometimes simple can at times be better. And, you just can't get things any more simple than the MFJ Cub ORP transceiver.

The MFJ Cub is a very small QRP trans L ceiver. It's a monobander, so you need to pick a band you want your MFJ Cub on. You can get an MFJ Cub for the 80, 40, 30, 20, 15, and 17 meter band. The MFJ Cub is a CW-only rig. It is a superhet-design receiver with VFO frequency control, and will produce up to 2 watts of RF at 13.8 volts. On 15 meters, you'll see about one watt of RF into the antenna. The MFJ Cub is not protected against high SWR. It's built around a single PC board, which is doublesided with solder mask and silk-screened with component placements.

What sets the MFJ Cub apart from the rest of the QRP rigs on the market is in the construction of the rig. The MFJ Cub is a kit, but 90 percent of it is already assembled. The reason why it's assembled? With the exception of the parts for the tuned circuits, the majority of the rig uses surface-mounted parts. In fact, the entire transceiver comes fully assembled. You only have to add on the necessary parts for the band you want to operate. In a nutshell, you assemble all the through-hole components in the MFJ Cub rig. MFJ packages the Cub with two

Photo A. The MFJ Cub.

different parts bags. One contains the generic components such as the jacks, PA final, and other larger components. The other bag contains the parts used in the tuned circuits.

The MFJ Cub is based on a very popular NE602 design. There are three \$A602s inside the rig. One is used as the receiver mixer, a second for the transmit mixer, and the third for the product detector and BFO. The audio output is supplied by an LM386 audio IC. Three crystals form a very selective filter for the receiver.

The MFJ Cub has several slick features. For one, it's protected from reverse polarity by a diode across the power source, and an internal PC fuse. If you hook the MFJ Cub up backwards, you pop the fused trace on the PC board, but you won't cook any of the surface-mount components. Also, it has electronic T/R switching for thumpless audio when switching between transmit and receive. The sidetone is also very clear and crisp.

Putting the MFJ Cub together

Really, this is not a hard kit to assemble. In fact, you can build one in about one to

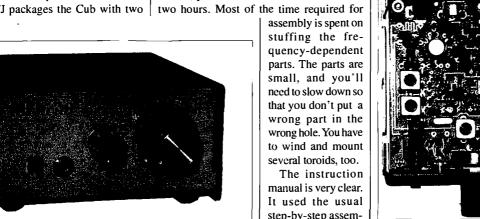
> step-by-step assembly method. Most of **Photo B.** Inside view.

the book deals with the various bands the MFJ Cub can be assembled on. Make sure you highlight the section you're working on, as it's easy to get misled if you start on one page, lose your place, and pick up somewhere else.

While you're working on the kit, it's kind off slick to see all those surface-mounted parts just sitting there. I would guess that MFJ's automatic surface-mount machine could assemble a PC board in a matter of seconds!

The next step in getting your MFJ Cub to work is doing the alignment. This is not difficult, and does not require the use of expensive test equipment. In fact, you can align the MFJ Cub with nothing more than a dummy load, a QRP wattmeter, and a communications receiver. During alignment, you set the BFO frequency and the receiver

Continued on page 59



Get Your Motor Runnin' ...

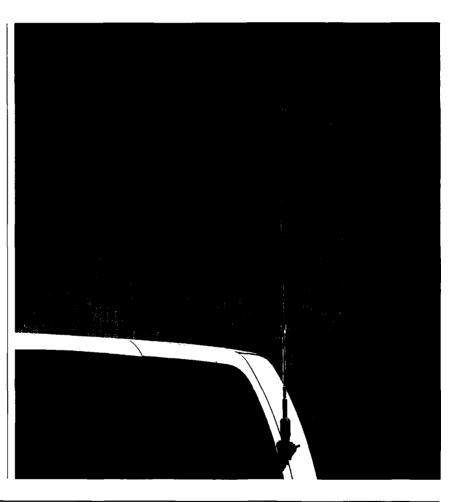
In this image supplied by NCG Company, the Comet CA-UHV antenna struts its stuff.

This is the second generation of multiband HF-UHF antennas by Comet. The CA-HV was the original model for HF-2m use, with the CA-UHV for HF-70cm. This new one is a 6m/2m/70cm triband antenna that is easily upgraded by attaching either one or two HF coils to the top and side. Adding more than two coils is possible, but the antenna becomes top-heavy when mobile.

The CA-UHV offers the modern ham several distinct advantages in mobile operation:

- Compact design for three, four, or five (or more) bands.
- Easy mounting via a standard trunk, door, or hatch mount. No drilling, welding, or special brackets are needed. Here we see the RS-730 mount and CK-3M5 deluxe coax cable assembly.
- Fold-over hinge allows for easy garage entry. A threaded collar securely holds the antenna upright while in motion but unscrews to use the hinge.
- The Comet CF-706A duplexer can combine two connectors (1.3–57 MHz and 75–550 MHz) into a single connector when using a single antenna.
 - List price: \$149.95.

So, even if you don't have a 1999 Dodge Ram pickup in the Southern California sun as shown here, you can still go big-time mobiling with this Comet antenna that's great for *any* vehicle *any*where.



NEUER SAY DIE

continued from page 4

in 20 minutes to pass the 5 wpm test. My "cheat" system has been used successfully by thousands of Techs and Novices. Learning the code quickly doesn't take a high IQ; it's just a matter of memory, not brains.

My business is also up for my \$5 fiveword-per-minute tape which teaches all of the characters in an hour, plus provides some practice exercises. Each character is sent at a 13 wpm speed, allowing you to get familiar with the sound of the character at the higher speed. For the truly dedicated. I have a 6 wpm practice tape (also \$5) which is fiendishly designed to be so maddening that you'll virtually snore through any VE code test.

To my surprise, the demand for my 13 and 20 wpm tapes has increased instead of died. More and more Techs, heading for the sunspot-high-fertilized HF bands, are learning the code so they can have fun, not because the government and the ARRL has forced them to. Particularly if you're going to have a ball with QRP, you're going to want to be

able to handle 20 wpm and get in there with the little boys, having a ball with one to ten watts and talking to anyone anywhere in the world.

Until the FCC, followed by the rest of the world. I expect, defies the ARRL again and expands the HF phone bands, there'll be acres of wide open space for QRPCW contacts. With today's selective receivers, there's room for ten to twenty CW contacts for every phone QSO. Of course, if someone were to come

Continued on page 61

The Universal Loop

continued from page 13

the 4mm plug pin ends, where they are securely soldered. Two small insulated blocks are next Super-Glued between loop and loop chassis, as shown, to prevent the loop "whipping."

The loop can now be tested, as previously described, and should effectively cover approximately 11 MHz-40 MHz.

It may be of interest to note that a replica loop was "lashed up" using lengths cut from wire clotheshangers. Contrary to what the textbooks tell us about the preferred use of copper or brass (over ferrous materials), there was no discernible difference in performance, apart from a small shift in frequency range!

General observations

- 1. The question of the use of a preamplifier between loop and RX now arises. I used high-gain souped-up receiving equipment. A preamplifier overloads this equipment, producing intermodulation. However, in those cases where a preamplifier is needed, there are many published simple designs for wideband preamplifiers. Also, they can be purchased at reasonable prices.
- 2. The loop design is such that experimenters' individual designs and ideas can be made and fitted to a loop plug-in chassis. With this in mind, a range of conventional, and lat, ferrite loops have been shown, together with a spiral and square loop. Obviously this leaves the enthusiast with plenty of scope for individual ideas and designs.
- 3. The total frequency range is shown as 55 kHz-40 MHz. The LF end was fixed to incorporate the UK Rugby MSF 60 kHz Time & Frequency Standard station, which comes in very loud and clear. A similar station in the USA is WWVB in Denver, Colorado, which also uses 60 kHz. The frequency range could be further lowered by addition of extra capacity across the LF Loop (Fig. 7).

Useful addresses

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Return of the Amazin' Hall Tree Vertical

continued from page 19

surrounding objects cannot be expected to operate as well as a full-size one in free space. Lately, sunspot activity has made 40 meters quite erratic

and noisy at times. This has made it difficult to collect much data on this antenna's performance. It has been used surrounded by trees in my front vard, too. Still, using 10 watts QRP on CW and 100 watts on phone, I have been able to make several contacts over 500 miles distant. The usual report was between 5/5 and 5/8.

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The Hybrid Vee

extension. This becomes the basis for one of the antenna tuning elements.

Note: This tuning tee is NOT required unless the entire 20-meter band is to be covered, and is not required at all for the 17-meter band. If used, the upright tee can also be used to attach one end of the antenna wire. If not, the antenna wire is directly fastened to the end of the PVC pipe extension as shown in **Fig. 1**.

The basic antenna wire is #12 AWG THNN insulated electrical wire, available from your local hardware store.

The slanted leg of the inverted vee portion of the antenna is attached to the one end of the tee at the top of the mast, leaving a "pigtail" of wire for soldering to the shield braid of the coax feedline. (Note: The inner conductor of the coax feedline will be soldered to the top end of the vertical wire

Continued on page 58



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The Hybrid Vee

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element, which is attached to the other end of the Tee at the top of the mast).

Drill a small hole in each end of the tee, passing the wire through the hole, and loop it around for mechanical strength before soldering it to the shield braid.

If you intend to use 100 watts or less output power to this antenna, then RG-58 C/M coaxial cable is inexpensive and suitable for the feedline.

The (approximately 50-ohm) impedance of the coaxial feedline is sufficiently close to that of the antenna so that a matching transformer is not required. Also, a slight imbalance between unbalanced feedline and the balanced feedpoint of the antenna is considered to be satisfactory, so no balun was used, but the purist who wishes to remove any unwanted radiation from the coax shield, and who wishes a symmetrical pattern of radiation, may construct a simple 1:1 current balun consisting of ferrite beads, slipped over and taped to the coax at the antenna attachment end. OR, a simple six-turn coil of RG-58 C/M taped together into a six-inch-diameter loop and placed at the antenna feedpoint may be used as a 1:1 balun instead.

Attach the bottom end of the sloping antenna wire to the PVC pipe with a hose clamp if a tee is not used for holding the tuning element (17 meters,

e.g.). Otherwise, drill a hole and use the same method as used for attaching the top end of the wire.

Dimensions: For 20 meters, the sloping wire is cut to a length of 16.5 feet (sixteen feet, six inches) and the vertical leg is cut to approximately 14.5 feet (fourteen feet, six inches). The reason for the shorter vertical element is that a telescoping whip (surplus or used TV-type "rabbit ear") is used for final tuning adjustments to desired frequency. Rabbit ears for this antenna were obtained from a local TV repair shop.

Making the tuning stubs

Mount a short length of 3/4"-diameter PVC tubing into the center leg of a 3/4" tee, and attach it to the mast opposite the boom arm by drilling it for a U-bolt. Position the tee upright. Then, drive a short piece of wood dowel, of a diameter to tightly fit, into the tee. Drill the dowel to accept the large end of the telescoping "rabbit ear," and slip the rabbit ear into the hole in the dowel, leaving an inch or two exposed at the bottom. Solder the bottom end of the vertical antenna wire to the rabbit ear. Now you have easy adjustment of the antenna frequency.

A similar tee at the boom end, complete with wooden dowel and rabbit ear, allows adjustment of each wire separately. In most cases this allows a perfect 1:1 SWR at the desired operating

frequency, and also totally eliminates the need for removing and replacing the antenna itself for wire trimming.

Results

I have found that practical onthe-air QSOs have been most rewarding. I have requested honest reports from stations in the USA and from DX stations. In each case, I told the contacted ham that I was trying out an experimental antenna and wanted a report, whether good, bad, or indifferent.

I used my Kenwood TS-440 and TS-450 transceivers for both transmitting and receiving, and the 20-meter and 17-meter antennas I built according to the drawings and description here. The 17-meter antenna is only 12 feet from apex to ground and the 20-meter antenna apex is at 17 feet above ground.

With no more than 100 watts of power output, I contacted SSB stations in Argentina, Brazil, Chile, and other South American countries, as well as France, Germany, Italy, Macedonia, Russia, Slovenia, and Spain. All gave me very readable, and sometimes very generous, signal strength reports.

The Taylor Hybrid is a simple, inexpensive antenna that almost anyone can build with locally available materials, for use in a limited space. The hybrid can be rotated easily for best signal reception and transmission from your location to desired areas of the world.

I believe the vertical element has added a substantial improvement to the already versatile Taylor Vee. Try one and see if you agree.

The Rocky Road to a Great Radio Club

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contacted by E-mail at: [WA2VNT/7@ece.arizona.edu].

The Conejo Valley Amateur Radio Club home page is located at: [http://www.cvarc.org/].

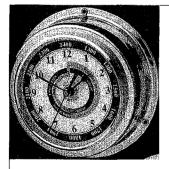
The Amateur Radio Newsline home page is located at: [http://www.arnewsline.orgl.

The Tucson Amateur Packet Radio home page is located at: [http://www.tapr.org].

The Radio Society of Tucson home page is located at [http://www.hamsrus.com/rst/rst.html].

The Tucson Computer Society home page is located at [http://www.aztcs.org/index.html].

A historical and tribute Web site dedicated to WABC Musicradio 77 of the 1950s through 1970s is located at



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ABOUE & BEYDND

continued from page 40

of the pipe, should be centered about the prime circular focus spot of the Fresnel lens. Cut the lens out carefully, using this center spot as the lens's exact center point of reference to the outer diameter.

Well, that's the full system description on the transmit side of the house. That should give you time to acquire components to construct your version of this system. Next month, I will cover the receiver system in detail, after some engineering still being finalized on a replacement for the synthesizer.

Of all of the components used in this project, the synthesizer (that we used) is the most expensive and does not have to be copied in your system. Any source of RF at some frequency, be it in the 2 meter amateur band or commercial upper VHF band (150 to 174 MHz), is usable.

We just had the synths on hand and used them for 2 meter HT operation — the synth is not mandatory. We haven't tried them, but there is no reason that a simple clock oscillator TTL module at another frequency couldn't be used or a simple crystal-controlled LO be constructed. This is a junk box decision on this project, so put the junk box to use here.

What I am thinking about for a minimum circuit is either a simple TTL clock oscillator running a frequency in the 2 meter band or one-half that frequency. If a clock oscillator is found that is one-half frequency, say, anything from 72 MHz to 74 MHz would still provide 2 meter usage. This oscillator would probably be injected into an MMIC amplifier, using it as a frequency harmonic doubling for LO mixer injection. I will be giving this a try, to see if I can design a suitable simple LO source to replace the synth we used.

Well, that's it for this month. Next month, in the column I plan to finish up the project with the receiver circuitry, more photos of the system, mount, and other construction details.

A clear conscience is usually the sign of a bad memory.

THE DIGITAL PORT

continued from page 54

with, and you may just find something you like.

Then, to go along with this, I received an E-mail from another reader who found that I dropped the ball on another listing a few months back. After I was unable to produce the original Web site location for a small Icom program, I sent along info on the YPLOG. He went into the search mode himself, came back to me, and pointed toward another control program available from a French author. I took a look, but unfortunately, my vocabulary is French-challenged and I could only guess at the features. So, for now, you are stuck with the stuff I can understand and explain.

If you have questions or comments about this column, E-mail me [jheller@sierra.net] I will gladly share what I know or find a resource for you. For now, 73, Jack KB7NO.

QAP

continued from page 55

bandpass filter. You'll set the transmit offset and transmitter bandpass as well. The final step is setting the output power. I found that all the adjustments were easy to make, and everything quickly fell into place.

Putting the MFJ Cub on the air

There's very little you have to do to get the MFJ Cub on the air. In fact, all you have to do is supply it with a suitable power source and an antenna. Plug in your headphones and attach your resonate antenna. Operation of the MFJ Cub is as simple as humanly possible. You can either tune around looking for stations calling CQ, or get bold and send out one yourself. When you key the rig, it switches over instantly, and you just key away.

Of course, it's always at the end of one of these columns where I have to say that my first contact was with some faraway land. But, just as the last screw was tightened down, I heard a W3 calling CQ on 10.107 MHz. With clip lead in hand, I sent my call. Whoa! Back he came. I had a tenminute QSO with this guy as I keyed in the CW with a clip lead. The MFJ Cub works like gangbusters! The MFJ Cub is a great little rig to have on your operating table. It's small, you can hold it in one hand, and it has enough humph to get the job done. The superhet design is sensitive and wellbehaved. All and all, I think the MFJ Cub is

one of the best values around for a kit-based ORP transceiver.

The MFJ Cub is available from MFJ, or you can contact any of the many dealers around the country to order one for yourself. You'll love its assembly as well as its operation.

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Sudden Surprises

The summer months of June, July, and August are not particularly favorable for HF communication — even as we approach the peak of Sunspot Cycle 23 — due to over activation of the ionosphere, which creates absorption of HF signals during the midday hours.

However, in the late afternoon and evening, the E and F layers return to more or less normal conditions for up to several hours, and the propagation of HF signals improves again.

In spite of this excessive summertime absorption and fading on the HF bands, VHF bands often become quite active for DXing, so, when HF activity seems poor, listen for good propagation on ten, six, and two meters.

As you can see from the calendar, propagation conditions are either Poor (P) or trending through Fair (F). Therefore, your best days for DXing appear to be the 7th through 11th, and again the 24th through the 31st, when Good (G) or Good-to-Fair or Fair-to-Good conditions prevail.

There will be sudden surprises that are not predictable this far (three months) in advance of publication. They include solar flares, disappearing filaments, coronal holes,

and other solar activity associated with sunspots that affect propagation. These so-called SIDs (Sudden Ionospheric Disturbances) result from disruption of the earth's magnetic field, and can spoil your day.

Band-by-band summary

10 and 12 meters

Good daytime DX

on transequatorial paths to North and South America, Africa, and the Pacific, is expected on (G)ood days, with signals peaking in strength during the local afternoon. Plenty of short skip to 1500 miles or more should occur on (G)ood days.

15 and 17 meters

Good daytime DX to many parts of the world, with maximum signal strength occurring during the late afternoon hours. These bands usually close after dark. Daytime short skip is expected to 2,300 miles and beyond on (G)ood days.

20 meters

Good DX conditions both day and night, with best signal strengths occurring after sunrise and again in the late afternoon and evening hours. You can also expect to hear strong signals in the west, northwest, and Pacific areas during hours of darkness. Daytime short skip beyond 2,000 miles is anticipated on most days.

30 and 40 meters

Good DX to most parts of the world from our location is likely during night-time

		E/	STE	RN U	NITE	D ST	ATES	TO:				
GMT:	00	02	04	.06	08	10	12	14	16	18	20	22
ALASKA							17/20	15/17	15/17	Γ		
AUSTRALIA	12/15	12/15			12/15	20/40	12/15	20				
CENTRAL AM.	15/17	15/17	15/17	40	40		20	20			10/12	10/12
EUROPE		30/40	30/40					12/15	12/15	20/15	12/15	12/15
FAR EAST					-	20	15/17	20				
ILAWAH	12/15	12/15	20/17	20/17	20/17		20					
INDIA	20	r —			20	20						15/20
MID-EAST	20	20/40	20/40		_					12/15	12/15	12/15
RUSSIA/C.t.S.	17/20	17/20	17/20							i ·		17/20
S.E. ASIA	15/17	17/20			$\overline{}$							
SOUTH AFRICA		40/30		17/20				12/15	12/15			
SOUTH AM.	15	15	20	20							10/12	10/12
WEST COAST	15/17	20	20	30/40	30/40	30/40	30/40		10/12	10/12		15/17
		CI	NTR	AL U	NITE	D ST	ATES	TO:				
ALASKA	15/17	17/20	17/20			30/40	17/20	17/20		1		
AUSTRALIA	15/17	15/17	17/20	17/20	20		20	20				
CENTRAL AM.	15/17	17/20	17/20	17/20	17/20		17/20	17/20	15/17	10/12	10/12	10/12
EUROPE	17/20	17/20	17/20									17/20
FAR EAST	15/17	17/20	17/20			30/40	17/20	17/20				,,,,,
HAWAII	15/17	15/17	15/17	20	20/30	30/40	_	17/20				<u> </u>
INDIA	15/17	20				-	20		-			15/17
MID-EAST	17/20	17/20	20			-				<u> </u>		-
RUSSIA/C.I.S.	17/20	17/20	17/20	17/20						12/15	12/15	
S.E. ASIA	15/17		20	20				20	-		-	15/17
SOUTH AFRICA				20					15/17	20	20	
SOUTH AM.	10/12	15/17	30/40	30/40		_					10/12	10/12
		wı	ESTE	RN U	NITE	D ST	ATES	TO:		L		
ALASKA	10/12	15/17	_	20	20	30/40		20		1		15/17
AUSTRALIA	10/12	15/17	15/17	20	20	20/30	30/40					*****
CENTRAL AM.	15/17	15/17	20/30	20/30	20/30	30/40		\vdash		10/12	15/17	10/12
EUROPE	20				20.00	30110	20		15/17	15/17	20	20
FAR EAST	10/12	15/17		20	20	30/40	 -	20	,	1.4.1.		15/17
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INDIA	15/17		 -	-300		350	۰	20	15/17	<u> </u>		
MID-EAST	20	20	 	<u> </u>	<u> </u>	 		 -	15/17	 	20	
RUSSIA/C.I.S.	20	20	20	20			 	-		l	۳	20
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SOUTH AFRICA	+ · • · · · · · ·		20	20		 	 		15/17	10.17	<u> </u>	<u> </u>
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SOUTH AM.	15/17	15/17	15/17	20	20	20/30	i			1	l .	10/12

	July 2000							
SUN	MON	TUE	WED	THU	FRI	SAT		
						1 P		
2 P-F	3 F	4 F	5 F	6 F-G	7 G	8 G-F		
9 F	10 F-G	11G-F	12 F	13 F	14 F	15 F		
16 F	17 F	18 F-P	19 P	20 P-F	21 F-P	22 P		
23 P-F	24 F-G	25 G	26 G	27 G	28 G-F	29 F		
30 F-G	31 G							

hours, beginning at sunset and extending after sunrise. High static levels due to occasional thunderstorms along the path of propagation may be expected. Short skip between 500 and 1,000 miles can be expected on most days.

80 and 160 meters

Some weak DX openings may occur during darkness hours and around sunrise, but will often be masked by high noise levels due to thunderstorm static. Night-time skip between 200 and 2,000 miles may be expected, but daytime skip will be limited to about 200 miles. 73, W1XU/7.

QRX

continued from page 6

- When all your friends got their hair cut at the kitchen table.
- When nearly everyone's mom was at home when the kids got there.
 - · When nobody owned a purebred dog.
- When a dime was a decent allowance, and a quarter a huge bonus.
- When you'd reach into a muddy gutter for a penny.
- When girls neither dated nor kissed until late high school, if then,
- When your mom wore nylons that came in two pieces.
- When all your teachers wore either neckties or had their hair done, every day.
- When Bible reading and prayer started every school day.
- When you got your windshield cleaned, oil checked, and gas pumped, without asking, for free, every time. And you got trading stamps to boot!
- When laundry detergent had free glasses, dishes or towels hidden inside the box.
- When any parent could discipline any kid, or feed him, or use him to carry groceries, and nobody not even the kid, thought a thing of it.
- When it was considered a great privilege to be taken out to dinner at a real restaurant with your parents.
- When they threatened to keep kids back a grade if they failed — and they did!
- When women were called, "Mrs. John Smith," instead of their own name.

And finally ...

 When being sent to the principal's office was nothing compared to the fate that awaited a misbehaving student at home.

Thanks to the September 1999 ARNS Bulletin.

Bills travel through the mail at twice the speed of checks.

NEUER SAY DIE

continued from page 56

along and re-invent John Costas K2EN's double sideband, where G.E.'s management did a world class job of dropping the ball, we'd be able to have five to ten or more DSB phone contacts using the same bandwidth as one SSB signal.

In the meanwhile, start putting together a QRP kit, buy a key, and let's see what you can rack up in DX contacts.

Oh, yes: Get me busy with my cassette duplicator, turning out more code tapes for you.

Gun 'Em Down

The gun control crowd got the upper hand in Australia, resulting in about 650,000 guns being confiscated, at a cost of more than \$500 million. Now, a year later, the first crime statistics reports are in. Countrywide, homicides are up 3.2%, assaults are up 8.6%, armed robberies are up 44% (!!). In the state of Victoria, homicides with guns are up 300%. And all this followed a 25-year steady decrease in armed robberies. There has also been a dramatic increase in break-ins and assaults of the elderly.

Well, it makes sense. Gun control laws only affect law-abiding citizens. The certainty that homes are not protected with guns is a license for criminals, who do have guns, to have a field day.

If you're interested in becoming an expert on the subject, with a host of solid statistics handy, you'll want to read John Lott's *More Guns, Less Crime*. It's \$23, published by the University of Chicago Press, 224 pages, 1998.

No, I'm not an NRA member, but the mobs screaming for gun control are ill-informed (a.k.a, ignorant), driven to reflexively demonstrate by dishonest politicians.

Crushed Babies

Maybe you heard about the Consumer Product Safety Commission warning parents that babies should never be allowed to sleep on adult beds, daybeds or waterbeds since that exposes the child to a "potentially fatal hazard." It turns out that 64 out of the 3,880,894 babies born in 1997 died on adult beds. I'd say we're in more danger from the CPSC than from rolling over on our babies and killing them.

Oh, yes, most of the babies were crushed by drunk parents.

If you read some of the more reliable literature on how best to raise a baby, you'll find that you get a happier and more intelligent baby if it is allowed to be with the mother full time, at least for the first year.

Say. I wonder how much the CPSC is costing us? I hope you'll ask your congressman to find better work for the staff of that government agency.

Illegal Rain Barrels

Crazy as it seems, the use of rain barrels is illegal in Colorado! If you think I'm really exaggerating, take a look at [www.gazette.com] and hunt for "rain barrel."

It's illegal in Colorado to divert a natural water source for domestic use which, of course, has to include rain. The idea was to protect the water rights of the people downstream, but the law is the law.

UNH News

I see where the unionized professors at the University of New Hampshire, about half of the 630-member faculty, voted to strike if they don't get raises over the next three years averaging over 5% per year. Considering that their salaries have increased by an average of 4.5% per year over the last eight years, this sure looks like another case of union bullying. That's almost a 150% salary raise they've had over the last eight years! Now they want more!

Here's a state run university that has not distinguished itself in any way I'm aware of, and I've been living full-time in New Hampshire for the last 38 years, where the teachers' union has seemingly gone berserk with power. I sure wish the NH Legislature would start holding some hearings so they could provide some guidance for the university. I'll bet the teaching staff could be pared down by half, with the students benefiting. I know the university could operate tuition-free, and without any additional funds from the state. I've outlined that approach in my past editorials and in my \$5 Improving State Governments book.

Further, and making a profit on the project, the university could make the curriculum far better fit the needs of its future alumni. I almost got Rensselaer to set up such a project, but the faculty, fearing (rightfully) that this would force them to make serious changes, was able to kill it.

If you want to get an idea of how bad our American university system is please read the book by George Roche, the 28-year now-ex-president of Hillsdale College, *The Fall of the Ivory Tower*. See the review on page 9 of my Secret Guide to Wisdom.

Textbook Survey

As if it isn't bad enough that our school kids are forced to memorize stuff to pass tests, stuff which goes in one eye and out the other, leaving little permanent evidence of it's having ever been there, maybe you read the report in *Time* that a study done by the American Association for the Advancement of Science has reviewed the most used middle school science textbooks. Not one got a passing grade.

So here we have a situation where the bottom 20% of high school graduates go to ed schools, which Rita Kramer, in her Ed School Follies survey report showed were worse than jokes, and where a recent PBS report showed were often "teaching" subjects they didn't know. And now, to no great surprise, we find that the texts our kids are using

Continued on page 62

NEUER SRY DIE

continued from page 61

are a bunch of crap. Is it any wonder that our kids are last in international surveys? The only category where our kids came in on top is in how good they feel about themselves.

No, throwing more money at the situation isn't going to improve it. It's the whole system that's screwed up. We don't need to move the deck chairs, we need to start from scratch and design a better public school system. And we have no shortage of examples of innovative schools that work.

Audible

With the Web excitement over MP3 coding for music, and now Audible of Wayne NJ's software encoding audio for narrower bandwidth and faster throughput for their audio books over the Web, I'd sure like to see some articles for 73 explaining these technologies for the readers. And then, the next obvious step will be to start applying them to our transmissions. How much can we cut down digital audio voice bandwidth? Can we even cut down the bandwidth of video to where we might be able to send more than slow scan pictures on 20m?

Capitalism

Socialism, communism, and fascism have all failed wherever tried. Capitalism works pretty well, but it has some serious weak points. The worst part of this is that I'm not much on just citing problems. I much prefer to discuss a problem and then propose a practical solution for it.

If you've kept up with my thoughts in these areas, you know I've griped about the horrendous cost of prisons, plus the fact that they are not what they claim to be and are named: correction facilities. My proposals in this field would seriously cut down on the number of prisoners we'd need to incarcerate by over 50%, cut the cost of their incarceration by about 90%, offer unlimited facilities, and actually would educate inmates to live more in peace with society.

Well, I won't go into the long list of social miseries and government wastes that I've discussed and offered creative solutions for.

But this capitalism business has me stumped. The system works well for small businesses. It works great for them. But, as soon as a business gets big, it tends to be a bully and the playing ground is no longer close to being level. Then, it gets even worse as their hired guns descend on Washington and the state capitals with their armies of lobbyists, drowning out the voices of both small business and the public in the ears of Congress and the administration. These bastards are running the country, and this whole democracy facade is a joke.

Heck, our country doesn't even issue its own money! A group of bankers got Congressional Democrats to give that plum away early one morning when no one was looking in 1913 and make it so the government has to borrow money from these bankers and pay interest on it when it spends anything. And just to make sure that there wouldn't be any serious fuss about this highway robbery, the bankers organized the buying of the country's major newspapers and then the broadcasting media. There isn't going to be any whistle-blowing over this, because they own the whistles.

All this power pays off. Big time! But not for you or me.

J.P. Morgan said that no corporate head should make more than 20 times what his workers were paid. By 1980, the typical big company CEO was taking home about 40 times what his workers were. By 1990, it was up to 85 times! By 1998, according to a recent study, the big company CEOs pocketed an average of 419 times that of production workers.

Michael Eisner, the chairman and CEO of Disney, earned more than \$575 million in 1998, for example. Well, Disney made a lot of money, you say. Sure, but what about Linda Wachner, the chairman and CEO of Warnaco, which makes Calvin Klein jeans? The company lost \$32 million in 1977, but Linda got paid \$73.2 million in salary, bonus (!), and stock options. Well, their accountants and lawyers had to organize the packages for minimum tax liabilities, so the taxable income had to be kept as low as possible.

When the big get bigger, they do it by killing off the small guys, and then the big guys who aren't as big as they are. And that's easy when you hold most of the cards. If you have franchisees who have invested in stores you supply, all you have to do is cut off some key supplies, and suddenly they're company stores. If you are a manufacturer, you contract out work to smaller companies, starting with small orders. Then, when they've come to depend on you, you give them a huge order. They borrow to get the machines to fill the order. You cancel the order, and they're for sale for pennies on the dollar.

In the music industry (remember, I used to publish the largest music magazine in the country, so I know that industry), there are six major labels (five are foreign-owned) and several thousand small independent labels. The majors can (and do) crush and buy any indie label they want, like swatting a fly.

How many car companies are there? Steel companies? And so on. In TV, there are three major networks. And Fox.

And all of these big companies have expanded everywhere in the world. IDG, the computer publishing giant, publishes computer magazines in about 60 countries. Or is it 75 by now?

I don't view this situation any more favorably than I do a New World Order global police state. But I don't have any proposals for changing the situation, so I'll just wring my hands about it.

Democracy is a pretty good system — particularly as envisioned by our founding fathers and enshrined in the Constitution. But the basic idea that 51% of the people can tell the other 49% what to do doesn't sit well

with me. I doubt that you bothered to watch the Ken Burns PBS program about the opening of the West. But it was a grim reminder of how rotten Americans can be. We mercilessly killed the Indians by the thousands. Women and children, too. And we weren't much kinder to the Chinese and Mexicans who were attracted by the gold rush. We were just as nasty as the Nazis were to the Jews and gypsies, the Chinese Communists to the landowners, and so on, to the current slaughters in Yugoslavia, East Timor, Rwanda, and so on.

Any ideas?

A Man Thing

Say, how come we don't have more women on our bands? Yes, of course I have a theory. Yes, it'll probably make them mad at me for saying it. Jeesh, there's a first!

Okay, let's get down to business on this one. What are the main ham interests? Rag chewing and DXing. I suppose I should have listed the making of totally brainfree contacts where nothing of the slightest interest is ever said as number one, but I didn't want to hold the mirror up to too many readers lest their steam fog it. So let's go with rag chewing and DXing.

DXing, with its pileups and the big clobbering the weak, is the radio version of a fist fight. The guy with the biggest rig and antenna usually wins. Women tend to be nonconfrontational, so this radio battle royal isn't their cup of tea. Men fight and women compromise. the psychology texts tell us. Well, there's no way to compromise your way to contacting 350 countries.

So, how about rag chewing. Same problem, kinda. Men talk man talk and women talk woman talk. Different subjects, totally. Women are interested in children, clothes, shopping, and so on. Men are more interested in sex, technology, cars, sports, and telling off-color jokes.

Then we have the splinter groups on RTTY, slow scan, packet, the satellites, and so on. These are technology-heavy pursuits. Now, I've talked with hundreds of YL hams at hamfests (and even a few on the air), but in my 60 years of hamming, I've met just two YL hams that were comfortable talking technically. One was a lovely gal from Trinidad who worked at Bell Labs, and the other I hired as the editor of 73. Alas, she (a) married a wealthy ham and moved to Costa Rica, and (b) smoked, so she died many years before she should have.

Oh, I can tell the story now. Kayla, who had been president of the YLRL, had a hobby. Other than amateur radio, that is. She was intent on bedding as many of the ARRL HQ staff and directors as she could, and she ran up a truly impressive score. She even nailed Ken Sessions K6MVH, who later was a 73 editor. No, she didn't score with me!

But, as usual, I digress. I hope that helps explain why we don't hear that many female voices on our bands. It's the Mars vs. Venus thing.

Wise Up!

Here are some of my books which can change your life (if you'll let 'em). If the idea of being healthy, wealthy and wise interests you, start reading. Yes, you can be all that, but only when you know the secrets which I've spent a lifetime uncovering.

.....Wayne

The Bioelectrifier Handbook: This explains how to build or buy (\$155) a little electrical gadget that can help clean the blood of any virus, microbe, parasite, fungus or yeast. The process was discovered by scientists at the Albert Einstein College of Medicine, quickly patented, and hushed up. It's curing AIDS, hepatitis C, and a bunch of other serious illnesses. The circuit can be built for under \$20 from the instructions in the book, \$10 (#01)

The Secret Guide to Wisdom: This is a review of around a hundred books that will help you change your life. No, I don't sell these books. They're on a wide range of subjects and will help to make you a very interesting person. Wait'll you see some of the gems you've missed reading. \$5 (#02)

The Secret Guide to Wealth: Just as with health, you'll find that you have been brainwashed by "the system" into a pattern of life that will keep you from ever making much money and having the freedom to travel and do what you want. I explain how anyone can get a dream job with no college, no résumé, and even without any experience. I explain how you can get someone to happily pay you to learn what you need to know to start your own business. \$5 (#03)

The Secret Guide to Health: Yes, there really is a secret to regaining your health and adding 30 to 60 years of healthy living to your life. The answer is simple, but it means making some difficult lifestyle changes. Will you be skiing the slopes of Aspen with me when you're 90 or doddering around a nursing home? Or pushing up daisies? No, I'm not selling any health products. S5 (#04)

My WWII Submarine Adventures: Yes, I spent from 1943-1945 on a submarine, right in the middle of the war with Japan. We almost got sunk several times, and twice I was in the right place at the right time to save the boat. What's it really like to be depth charged? And what's the daily life aboard a submarine like? How about the Amelia Earhart inside story?If you're near Mobile, please visit the Drum. \$5 (#10)

Wayne's Caribbean Adventures: My super budget travel stories – where I

visit the hams and scuba dive most of the islands of the Caribbean. You'll love the special Liat fare which let me visit 11 countries in 21 days, diving all but one of the islands, Guadeloupe, where the hams kept me too busy with parties. \$5 (#12)

Cold Fusion Overview: This is both a brief history of cold fusion, which I predict will be one of the largest industries in the world in the 21st century, plus a simple explanation of how and why it works. This new field is going to generate a whole new bunch of billionaires, just as the personal computer industry did. \$5 (#20)

Cold Fusion Journal: They laughed when I predicted the PC industry growth in 1975. PCs are now the third largest industry in the world. The cold fusion ground floor is still wide open, but then that might mean giving up watching ball games. Sample: \$10 (#22). Julian Schwinger: A Nobel laureate's talk about cold fusion—confirming its validity. \$2 (#24)

Improving State Government: Here are 24 ways that state governments can cut expenses enormously, while providing far better service. I explain how any government bureau or department can be gotten to cut it's expenses by at least 50% in three years and do it cooperatively and enthusiastically. I explain how, by applying a new technology, the state can make it possible to provide all needed services without having to levy any taxes at all! Read the book, run for your legislature, and let's get busy making this country work like its founders wanted it to. Don't leave this for "someone else" to do. \$5 (#30)

Mankind's Extinction Predictions: If any one of the experts who have written books predicting a soon-to-come catastrophe which will virtually wipe most of us out are right, we're in trouble. In this book I explain about the various disaster scenarios, like Nostradamus, who says the poles will soon shift (as they have several times in the past), wiping out 97% of mankind. Okay, so he's made a long string of past lucky guesses. The worst part of these predictions is the accuracy record of some of the experts. Will it be a pole shift, a new ice age, a massive solar flare, a comet or asteroid, a bioterrorist attack? I'm getting ready, how about you? \$5 (#31)

Moondoggle: After reading René's book, NASA Mooned America, I read everything I could find on our Moon landings. I watched the videos, looked carefully at the photos, read the astronaut's biographies, and talked with some of my readers who worked for NASA. This book cites 25 good reasons I believe the whole Apollo program had to have been faked. S5 (#32) Classical Music Guide: A list of 100 CDs which will provide you with an

outstanding collection of the finest

classical music ever written. This is

what you need to help you reduce stress. Classical music also raises youngster's IQs, helps plants grow faster, and will make you healthier. Just wait'll you hear some of Gotschalk's fabulous music! \$5 (#33)

The Radar Coverup: Is police radar dangerous? Ross Adey K6UI, a world authority. confirms the dangers of radio and magnetic fields. \$3 (#34)

Three Gatto Talks: A prize-winning teacher explains what's wrong with American schools and why our kids are not being educated. Why are Swedish youngsters, who start school at 7 years of age, leaving our kids in the dust? Our kids are intentionally being dumbed down by our school system—the least effective and most expensive in the world. \$5 (#35)

Aspartame: a.k.a. NutraSweet, the stuff in diet drinks, etc., can cause all kinds of serious health problems. Multiple sclerosis, for one. Read all about it, two pamphlets for a buck. (#38)

One Hour CW: Using this sneaky booklet even you can learn the Morse Code in one hour and pass that dumb 5wpm HF entry test. \$5 (#40)

Code Tape (T5): This tape will teach you the letters, numbers and punctuation you need to know if you are going on to learn the code at 13 or 20 wpm. \$5 (#41) Code Tape (T13): Once you know the code for the letters (#41) you can go immediately to copying 13 wpm (using my system). This should only take a couple of days. \$5 (#42)

Code Tape (T20): Or, you can start right out at 20 wpm and master it in a weekend. \$5 (#43)

Wayne Un-Dayton Talk: This is a 90minute tape of the talk I'd have given at the Dayton, if invited. \$5 (#50)

Wayne Tampa Talk: This is the talk I gave at the Tampa Global Sciences conference—where I cover amateur radio, cold fusion, health, books you should read, and so on. \$5 (#51)

SI Million Sales Video: The secret of how you can generate an extra million dollars in sales just by using PR. This will be one of the best investments you or your business will ever make. \$40 (#52) Reprints of My Editorials from 73. Very few things in this world are as we've been taught, and as they appear. I blow the whistle on the scams around us, such as the health care, our school system, our money, the drug war, a college education, sugar, the food giants, our unhealthy food, fluorides, EMFs, NutraSweet, etc.

1996 Editorials: 120 pages, 100 choice editorials. \$10 (#72)

1997 Editorials: 148 fun-packed pages. 216 editorials. \$10 (#74)

1998 Editorials: 168 pages that'll give you lots of controversial things to talk about on the air. \$10 (#75)

1999 Editorials: 132 pages of ideas, book reviews, health, education, and anything else I think you ought to know about. \$10 (#76)

2000 Editorials: In the works.

Silver Wire: With two 3" pieces of heavy pure silver wire + three 9V batteries you can make a thousand dollars worth of silver colloid. What do you do with it? It does what the antibiotics do, but germs can't adapt to it. Use it to get rid of germs on food, for skin fungus, warts, and even to drink. Read some books on the uses of silver colloid, it's like magic. \$15 (#80)

Wayne's Bell Saver Kit. The cable and instructions enabling you to inexpensively tape Art Bell W6OBB's nightly 5-hr radio talk show. \$5 (#83) NH Reform Party Keynote Speech. It wow'd 'em when I laid out plans for NH in 2020, with much better, yet lower cost schools, zero state taxes, far better health care, a more responsive state government, etc. \$1 (#85)

Stuff I didn't write, but you need: NASA Mooned America: René makes an air-tight case that NASA faked the Moon landings. This book will convince even you. \$25 (#90)

Last Skeptic of Science: This is René's book where he debunks a bunch of accepted scientific beliefs – such as the ice ages, the Earth being a magnet, the Moon causing the tides, and etc. \$25 (#91)

Dark Moon: 568 pages of carefully researched proof that the Apollo Moon landings were a hoax—a capping blow for René's skeptics. \$35 (#92)

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The 73 Flea Market, Barter 'n' Buy, costs you peanuts (almost)— comes to 35 cents a word for individual (noncommercial!) ads and \$1.00 a word for commercial ads. Don't plan on telling a long story. Use abbreviations, cram it in. But be honest. There are plenty of hams who love to fix things, so if it doesn't work, say so.

Make your list, count the words, including your call, address and phone number. Include a check or your credit card number and expiration. If you're placing a commercial ad, include an additional phone number, separate from your ad.

This is a monthly magazine, not a daily newspaper, so figure a couple months before the action starts; then be prepared. If you get too many calls, you priced it low. If you don't get many calls, too high.

So get busy. Blow the dust off, check everything out, make sure it still works right and maybe you can help make a ham newcomer or retired old timer happy with that rig you're not using now. Or you might get busy on your computer and put together a list of small gear/parts to send to those interested?

Send your ads and payment to: 73 Magazine, Barter 'n' Buy, 70 Hancock Rd., Peterborough NH 03458 and get set for the phone calls. The deadline for the October 2000 classified ad section is August 10, 2000.

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Microsoft: The FINAL Final Judgment

Bill Gates dies.

St. Peter meets him at the Pearly Gates (no relation) and says. "Well, Bill, you've led an interesting life. To be perfectly honest about it, we're not sure where to send you. Very innovative, very creative, but then all these government problems. So I tell you what: We'll let you decide."

Gates swallows nervously. "Okay."

St. Peter snaps his fingers. Instantly they are at a sunny beach. There's beer, rock music, and topless women playing volleyball. Gates says, "Hey, this must be Heaven. It's great!"

"No," says St. Peter. "Actually, it's Hell. I'll show you Heaven next." He snaps his fingers again, and instantly they're in a serene city park. There's a soft, warm breeze, and birds chirp in

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NEUER SRY DIE

Wayne Green W2NSD/1

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Bashing?

Tom Sowell, in a recent column, wrote, "It is amazing how many people consider it an *answer* to criticism to call it bashing."

Yes, I've often been critical of the ARRL, our *only* national ham organization. And, yes, the response I've gotten from many ARRL true believers is that I'm "bashing" the League. So, how can I answer to such a stupid nonresponse?

I think you'll be hard put to find any time I've been critical of the ARRL when I haven't offered creative suggestions on what they could have done or be doing. I try to always be positive in my criticism.

For instance, recently I've been critical of the League and its directors for not mounting a national amateur radio promotion campaign aimed at reaching teenagers with the message that ham radio is fun, can provide them with a lifetime of adventure, and is a wonderful steppingstone into a high-tech career—and that's where the money is now and is going to be for a long time to come.

Sitting at home surfing the Internet, playing computer games, or spending hours in chat rooms isn't likely to lead to adventure or anything positive careerwise. Hacking might, if you could tap the Bank of England without getting caught. Good luck.

How many articles have you seen in the national magazines about the fun of using our two dozen ham satellites? Or about being able to talk with our astronauts while they're in orbit? Or about our thousands of repeater systems, which today are almost everywhere? Yes,

there's even a Swaziland repeater.

Please join me in "bashing the Lea- gue" until we start seeing them making the public aware that ham radio is not only still around, but is alive and well. I want to see TV programs with hams. I want my readers to be sending me envelopes of clippings about ham activities from their local papers. I want to see articles in *Reader's Digest* and other national magazines.

Girls, would you like to be smothered in testosterone? Get on your local repeater and attend a few local ham club meetings.

Please invite your division director to your next club meeting and let him know in a way he won't forget it that it's time for him to get the HQ gang off the Newington golf courses and doing the promotion of the hobby that is their responsibility. "Bash" him for letting you, the members, down. Send him to the next board meeting with a big bottle of castor oil to get things unstuck at HQ. How about an air horn to wake 'em up? Boy, I'd love to be there for that meeting! Hell, I'd hand out enema bags with the 73 logo on 'em.

The Russian Meltdown

Have you noticed all the fuss about our trading with China, yet nothing at all is being said about our trading with Russia? Maybe you've noticed that we're wearing shoes, socks, pants, and shirts made in China. We're using telephones and flashlights made in China, but nothing we buy has a Made In Russia sticker on it. Hmm, how



Well, as we know, the Cold War ended with Russia's socialist economy collapsing. What we haven't read much about is the replacement of the ruthless Communist bosses by even more ruthless gangsters, pretending to be capitalists, and funded by Western opportunist financiers.

The gangsters grabbed the Russian state-owned industries such as telecommunications, gas, oil, steel, paper, and the gold, silver, and diamond mines; sold shares to Western investors at fire-sale prices; pocketed the cash; became millionaires; and kept control of the industries.

Then, led by the Clinton Administration, the IMF, World Bank, US AID, and other lending agencies poured money and officials (to help spend it) with huge salaries into Russia, driving up the prices for vacation homes, rents, and goods. This was made infinitely worse for the Russian people by an almost 3,000 percent inflation, which wiped out their savings. The inflation was mainly caused by our Treasury Department demanding that price controls be removed. Since the government had spent most of its money on the military, thus not providing consumer goods for their people to buy, the people had accrued huge savings. Suddenly, these were gone and the people were

When word leaked out of the economic disaster, the Russian stock market collapsed.

Now the IMF and other "lenders" have lost their (our) money, Russian gangsters

own and run the country, and the people are suffering the worst poverty in the history of the country. There are no goods to export, nor any money to buy imports. And the Russian people can thank our politicians and bankers for what's happened — and for our media being silent about the catastrophe.

How We're Doing

Not well, that's how.

I was just looking at the results of international tests of our eighth graders. In math, our kids came in last in comparison with the kids in 13 developed countries. Our kids scored 500. The kids in Singapore scored 643, the Koreans 607, and the Japanese 605. In science, the Singapore kids again were number one with 607. Korean kids were 565, and Japanese 571. Our American kids were 534.

Well. our teachers' unions tell us, all we have to do is spend more money. Sure. The 1994 per student expenditure for secondary schools was an average of \$6,680. Korea left us in the dust educationwise for \$2,170 per student.

The teachers' unions also keep saying that we need smaller classes (and thus more teachers). In 1996, our secondary schools had 16.1 students per teacher. Korea had 24.3 students per teacher. Our primary schools had 16.9 students per teacher vs. 31.2 for Korea.

Maybe we should send

Continued on page 59

Continued from page 1

the trees. Old folks sit on benches, feeding pigeons ger, longer-lasting storms, and more of them. and playing chess.

"What do you think?" St. Peter asks.

"Well ... this is nice ... but given a choice, I'll take Hell," Gates says.

"Very well," St. Peter says. "You've got it." He snaps his fingers, and Gates instantly finds himself awash in molten lava. In unspeakable agony, he hears demonic laughter amidst the screams of the damned.

"HEY!" Gates screams, "It wasn't like this! Where's the beach? Where's the babes?"

St. Peter turns from his laptop and says: "Sorry, Bill, that was the demo. To review your other options, please try to hold on for six hours until the next available placement saint can speak with you, and have your credit card ready for the nonrefundable \$375 upgrade fee."

With alterations, and thanks to unknown Internet author, via the Bluegrass ARS Qua/Ham News, January 1996, Bill De Vore N4DIT, editor, via the ARNS Bulletin, November 1996.

Industry Ready to Work with ARRL?

The ham radio business community appears to be poised to work hand in hand with the American Radio Relay League to increase the numbers of new hams. Representatives for the two met in Dallas to lay further groundwork for what may be the next step in revitalizing the United States Amateur Radio Service, and, according to manufacturers' representative and 73 Ad Sales Director Evelyn Garrison WS7A, getting the word out to the nonham public will be a key issue at the gathering.

Until now, the relationship between the ham radio business community and the ARRL has been tenuous at best, and there has never been a truly close relationship. In fact, at times it's been quite adversarial. That appears to be changing, and Evelyn Garrison gives credit to one man, the newly elected president of the ARRL, Jim Haynie W5JBP. Congratulations also go out to Bob Heil of Heil Sound for being the first to step forward with a (\$1,000) contribution.

Among other topics under discussion was Haynie's concept of putting ham radio into middle schools across America. Dubbed the Big Project. it is a cooperative venture among the League, the education community, and major industry.

Thanks to Newsline, Bill Pasternak WA6ITF, editor.

Hurricanes on the Horizon

Hurricane season is here and the outlook isn't pretty. Federal storm specialists predict an aboveaverage storm season - one that calls for stron-

The outlook is for at least 11 tropical storms. seven of which will be hurricanes, of which three will be major. And this puts US coastal areas and the Caribbean islands at a much higher risk of experiencing a tropical storm or hurricane. according to James Baker.

Baker is head of the National Oceanic and Atmospheric Administration. He says the 2000 season forecast is similar to last year's. That one included a series of serious storms. One of these was Hurricane Floyd, which caused massive evacuations along the southeastern coast and then inundated North Carolina.

Baker says that it could all repeat itself this year. For ham radio operators involved in severe weather watch and post-storm relief, that means getting ready right now. Not just with weekly onair practice drills, but also in getting supplies and equipment ready for what forecasters say is in store. With more and more storm-related communications taking to VHF and UHF FM, hams will want to have extra battery packs for their handhelds along with some way to charge them if main power is disrupted. The same holds true for repeaters. This is the time to install that battery backup and maybe even a solar power backup system.

James Lee Witt, who is the director of the Federal Emergency Management Agency, stresses the importance to all who live in possible target areas of having a plan and being prepared for the storms. He commends community efforts, including one called Project Impact, which help people strengthen their homes against nature's rampage.

Thanks to Bill Burnett KT4SB, via Newsline, Bill Pasternak WA6ITF, editor.

Ham Health

A noted researcher says that he will spend the next several years trying to determine if hams die for reasons that are different from those of the rest of mankind. And, the American Radio Relay League is helping in the project.

National Cancer Institute researcher Kenneth Cantor has embarked on an epidemiological study of radio amateurs. Cantor wants to evaluate whether causes of death among amateurs differ from those of the general population. If it turns out that they do differ, he then wants to find out whether the individual's "usual occupation" might explain the differences.

Cantor described his investigation as an "inexpensive kind of quick study" that would not yield fine detail. As a result, it would be "wrong" to ascribe deaths to any particular factor. He wants to learn about influences amateurs tend to be exposed to in addition to RF energy.

Some discussion has taken place focused on a similar study done 15 years ago by Samuel Milham, Wording in that study's conclusions led many to believe that the Milham study had presented evidence that RF energy caused "an excess of leukemia."

Cantor emphasizes that his investigation is a preliminary study, based on a statistical comparison of FCC licensing records and State of California death records. Additional death records might be included as needed. The initial "cohort group" for Cantor's study includes more than 100,000 men and women - seven times larger than the earlier Milham study.

"This type of study can be performed at minimal cost, but it has the potential for misleading results," says ARRL RF Safety Committee Chairman Greg Lapin N9GL - himself a research professional. Lapin explained that in the event of "apparent associations" in the results of Cantor's study, a follow-up study would be conducted. The followup would involve individual questionnaires and contact with the families of Silent Keys something the Milham study did not attempt to

No exact date for completion of the Cantor study has been announced.

Thanks to the ARRL and Rick Lindquist N1RL, via Newsline, Bill Pasternak WA6ITF, editor.

All-Time Headlines

- · Include Your Children When Baking Cookies
- · Something Went Wrong in Jet Crash
- Expert Says Police Begin Campaign to Run Down Jaywalkers
 - . Drunk Gets Nine Months in Violin Case
 - Iraqi Head Seeks Arms
 - Panda Mating Fails: Veterinarian Takes Over
 - · British Left Waffles on Falkland Islands
 - Teacher Strikes Idle Kids
 - · Clinton Wins on Budget, But More Lies Ahead
 - · Plane Too Close to Ground, Crash Probe Told
 - . Miners Refuse to Work After Death
 - · Juvenile Court to Try Shooting Defendant
 - . Stolen Painting Found by Tree
- Two Sisters Reunited After 18 Years at Check-
 - Never Withhold Herpes Infection from Loved One
 - War Dims Hope for Peace
 - . If Strike Isn't Settled Quickly, It May Last a While
 - Cold Wave Linked to Temperatures
 - · Couple Slain; Police Suspect Homicide
 - · Red Tape Holds Up New Bridges
 - Typhoon Rips through Cemetery; Hundreds Dead
 - · Man Struck by Lightning Faces Battery Charge
 - New Study on Obesity Looks for Larger Test Group
 - Astronaut Takes Blame for Gas in Spacecraft
- Kids Make Nutritious Snacks
- . Chef Throws His Heart into Helping Feed Needy
- · Local High School Dropouts Cut in Half

Thanks to the May 1998 issue of SMARC SPARKS, newsletter of the Southern Maryland ARC, Al Abercrombe W2GJS, editor, via the ARNS Bulletin, July 1998.

From the Ham Shack

Bernard Weinstein KB2PMH. Hey, Wayne! I am an Art Bell junky. On the first interview I heard, I went into "miscreance mode" the moment you mentioned Moondoggle, and shut Mr. Radio down. On this last interview, I got interested and ordered your *Moondoggle* book to see if you could be taken seriously. Now, I must admit NASA "done" an excellent job!! I expect to be taking much of the advice you give in your *Secret Guides*. You see, I am about your age, only I am on the other end of the success curve. Forgive me if I can't eat raw chicken! Chicken livers, maybe. Thank you! I love your stuff!

I didn't know I liked raw chicken until I had it at a Tokyo restaurant. If you enjoy raw fish (sushimi), try chicken with tare sauce and see. — Wayne.

Bob Metcalf WB9SLQ, Auburn IN.

Burt Syverson K5CW's article in the June publication was very interesting. Burt mentioned one of the greatest inventors, not only of the past century, but of all time. Philo Farnsworth, at the age of 13, had a vision of the process he could use to invent the television system. He not only invented the entire television system, when GE and RCA with all their resources could not do so, but also the electron microscope, incubators for babies, the inertial guidance system used in space exploration, and many other far-reaching inventions.

I called my friend, Mrs. Philo Farnsworth, the 92-year-old widow, and told her of the article, and she was thrilled. She enjoyed the article very much and asked that I thank 73 and Burt for her. For those of you interested in a piece of history, Mrs. Farnsworth has written an excellent book about her husband, their life together, and his inventions and battles with the corporate giants who tried to steal his inventions. If you would like a personalized, autographed copy of this great book, Distant Vision, by Elma G. Farnsworth, send a check for \$27 (\$25 plus \$2 for shipping) to: Mrs. Philo Farnsworth, c/o Bob Metcalf WB9SLO, 111 E. 9th Street, Auburn, IN 46706.

Edward A. Butorajac KM4QQ. I was not sure how to take the "On the Cover" article on page 26 of the April issue. Was this meant as an April Fool joke or was it a test? Anyone who has been around the Morse code and CW arena for any amount

of time can identify the bug on the cover as a Vibroplex Golden Presentation semi-automatic key. Over the years I have owned two of them. One like that pictured on the April cover and one very similar, except that it was of earlier manufacture and had two speed adjusting weights instead of the single weight as pictured (and as on the one I now own). This is a really fine code machine and was the mainstay of high speed ops before the advent of the keyer. Your write-up on page 26 identifies this key as an iambic hand key made by Bencher. Nothing could be further from the truth! In fact, the Vibroplex name can be seen if you look closely at the picture on the cover.

Glad to see someone is paying attention around here. — Wayne.

Neil Cline KB8KVH. I enjoyed the several articles on code and CW in the April 2000 issue. However, I am a little surprised that there was no mention of using a surplus, computer clock oscillator instead of a buzzer in the basic code practice unit. Hook a 9 volt battery up on 2 of the 3 active pins, with the key interrupting the 9 volt power, and you have a realistically sounding CW signal at the frequency stamped on the clock oscillator.

When placed near your receiver, the signal can be tuned in just like a real CW signal. Adding about 4" of wire antenna to the clock output pin increases the transmitting range to about 10 feet. They are readily available at any electronic surplus mail order house for between \$2 and \$5, and come in a variety of frequencies, including the "color burst" frequency in the lower 80 meter band. I use them as a signal generator/frequency standard to calibrate my home-rolled, toy receivers.

Also, they are small enough to install inside an old 9 volt battery case using its terminal connectors to snap onto the 9 volt supply battery.

Update

Jeff Seligman, subject of our interview in the July issue ("The Rocky Road to a Great Radio Club") has a new call: K2VNT/7. He can be reached via E-mail at [seligman@ecc.arizona.edu]. Tnx WA6ITF.

Vincent L. O'Lear WR8U, Newton Falls OH. Regarding the April issue of 73, and the QRX article about the Universal Licensing System (ULS):

I used the Internet access our local Library provides to do something different today. I accessed the FCC Web page and used the address provided in QRX to attempt to register under the ULS.

Filling out that form was easy until I tried to enter my telephone number. I no longer have a telephone, so I tried entering NONE. I got a little box that said "NONE" was invalid. Then I tried my old area code, with seven zeros ... and it accepted that! But after clicking to register

Continued on page 41



Carol N. Hutkin K2BL, Voorhees NJ. This photo is of my friend KC2AZU in action. She combines her rollerblading hobby with hamming it up. She is frequently found on the local repeater talking as she gets regular exercise. Often she will check in on the nets "portable on roller blades." Mary is an example of determination in action. Through hard work, Mary went from nonham to Extra in under a year. Now, if only we could get her to wear a helmet!

Vladimir A. Skrypnik UY5DJ Pravdinska, 58 Kharkiv - 107 Ukraine 61107 [uy5dj@yahoo.com]

Really PIC Key, PIC Key

Add memory functions to your PIC keyer project.

Amateur radio experimenting is a fascinating and ongoing process, and we amateurs are driven by the sheer delight of learning by doing. And it is a long-standing convention that most amateur radio projects are in a state of continuous modification—the more we learn, the more we desire to incorporate into our projects.

I've prepared this follow-up article in accordance with this tradition. My original PIC keyer project appeared in the September 1999 issue of 73 Amateur Radio Today. and now that you've built the original circuit, it's time to enhance its performance! Let's begin by teaching the little hummer to automatically send frequently used CW messages.

Table 1 lists some sample messages. but of course you will use your own

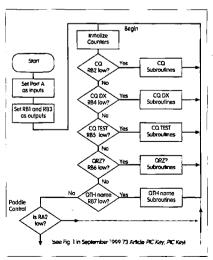


Fig. 1. Operation algorithm for the upgraded PIC-controlled keyer.

personal data. Consider how great it will be to send the entire message with the single press of a button (and send perfect, machine-formed characters in the process!). Push the button, lean back, and wait for an answer. Ol' Morse and Marconi are probably looking down and smiling.

Operational algorithm

The new operational algorithm is more complicated than the original one, but it takes a little patience and coaxing with code to entice the little PIC to perform new tricks.

Let's begin with **Fig. 1.** Notice the left bottom corner, the portion entitled "Is RA2 low?" After the words "Paddle control" and down to the end

is the same algorithm as the previous article (refer to Fig. 1 in *PIC Key, PIC Key*). We will only be discussing the new section of the algorithm — from "Start" to "Is RA2 low?" Let us make an excursion through the chart.

As usual, the program runs from the point labeled "Start". If you remember, the microcontroller PIC16F84 has 5 input/output lines at port A and 8 at port B. In previous programs, we programmed port A as input and all of port B as output. But actually we used only two lines as outputs — one for keying the transmitter and the other for audio control.

In this version of the program, it seems wiser to set all lines of port A, as well as almost all at port B, as inputs.

Message number	Message text
1	CQ CQ CQ de UY5DJ UY5DJ UY5DJ PSE K
2	CQ DX CQ DX CQ DX de UY5DJ UY5DJ UY5DJ PSE K
3	CQ TEST CQ TEST de UY5DJ UY5DJ TEST K
4	QRZ? QRZ? de UY5DJ UY5DJ PSE K
5	My QTH is Kharkiv Kharkiv es name is Vlad Vlad PSE K

Table 1. Frequently used CW messages.

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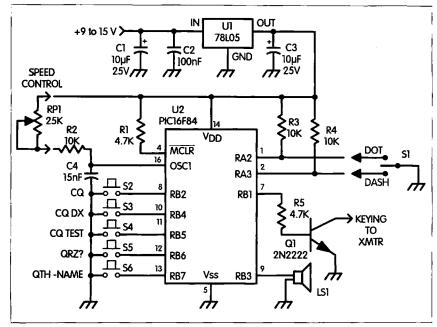


Fig. 2. Schematic of the improved keyer.

There are two exceptions — RB1 and RB3 are left as outputs. The next step is to initialize all counters in the program. This point is rather important, and marked by the label "Begin". Many times during operation, the program will come here and begin its run down to the end.

As you sensed while reading above, this keyer has several new input pushbuttons connected to the appropriate inputs of the microcontroller. By pressing one button we make that input low, which creates the desired message.

After initialization, the program checks to see if a pressed button is connected to the RB2 line. If it was pressed, the CQ message (number 1 in **Table 1)** is requested. The program will go to the "yes" direction to run the set of CQ subroutines. It causes transfer of the Morse code signals to the output. When the message is completed, the program goes back to the "Begin" label and everything will repeat.

When RB2 isn't low, the program will check to see if the "CQDX" button was pressed. It can find RB4 either high or low. If it is low, the program sends message number 2 from the table. In the opposite case, the program checks for low condition and consequently port lines RB5, RB6, and RB7. If it finds any low, the program sends the appropriate message and returns to the re-initialization of the counters. If no buttons were pressed, the program, after the last examination of RB7, continues

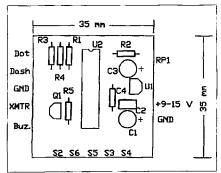


Fig. 3(a). PIC keyer PC board, component side.

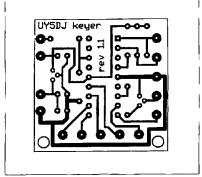


Fig. 3(b). PIC keyer PC board, foil side.



/ 		== May 1999 C≌ kayar		1	call	deah	, latter "n"
2		var. 1.1			call	peuse2 dot	. letter "a"
Vied Ekr	ypnik, trest		E-mail: uy5djäyahee.com		call	dash pansa2	
	list	p=16094			call	ciana):	. letter "m"
	config	2x3££3	- Br clock samillator		call call	dagh 303502	
,	CPC eq	ustes (semo	ry map)		cal?	#ot	; letter "e"
porta	- en	0x05	• •		call call	LP is	; "is"
persh countl	eds eds	Ozić Ozic	rfor DOT delay constant		call)pyreamo	
munt2	equ.	Dadd Dade	for PAUSE dalsy constant for PASE dalsy constant		cali cali	MyName PSE	
count3	कर्तुप सर्वेप	DaOf	for 2xPAUSE dalay constant		gall	×	
count5	equ	0x10	:for SxPAUSE delay constant	,	goto	bogin	
,	org	04000		;		Subroutine "CQ"	
stort	moviw trim	Deff	; teach port A as inputs	- co	call call	dash dat	
	HOVIN	ひまなか			0al1	dauh	
	trie bol	portb, 1	/ teach port RB1 and RB3 as outputs		call	dot psuse2	
	baF	portb, 3	; set RB3 low		onll.	desh	•
	abrrau monfa	0x75	// set internal pullup resistors :/ on port B imputs anabled		call call	desb dot	
:					mall	dash	
begin	clrf clrf	countl count2	: initialize counters]	call return	T.B	
	cltf	count3		·	· · · · · · · · · · · · · · · · · · ·	mbroutine "75"	
	clrf clrf	countă countă		from	call	dash dot	
	Call:	og CD		i	call	det	
ta LaCC	btfec Gate	porto, 2	: 12 322 low? (pin 1)	1	call call	pauseZ dot	
	call	00		1	call	IP.	
	call	co co		2		direction "DX"	• •••••
	call	fres		tox.	call	daat	
	call call	MyCall MyCall		1	call call	dot dec	
	call	MyCall			onll	pause2	
	call	PEE K		!	call call	dest	
	goto	begin		1	call	dot	
OODX	bufse	ng CC DX portb.4	: is RB4 low? (pin 10)		call call	dash シア	
	goto	COTEST			return		
	call call	DX DX		TEST	call	dash	
	call	CO			0011	pausa2	
	call	es ex			ozli pall	dot pauso2	
	cn.1.1	DX		1	call	dot	
	call	from MyCall			cell cell	dot	
	call	MyCall			call	pause2	
	call call	MyCall PAE			call call	dash 139	
	call	DX			return		
	call goto	pedre K		i.e.	oall	dot	; latter "i"
	Callar	NA US BEST .		1	call	dos	
CIEST	htifac goto	porth,5 One	: 15 K95 low? (pin 11)	ļ	call cali	pausez do:	: letter "s"
	call	CC C		i	call	dot	
	call call	TEST			call call	dos As	
	cell	TEST			return		*****
	#2)1 #2)1	from HyColl		18yCa	12 4411	dot	. letter "u"
	call	MyCall			mall	dot	
	call call	TEST X			call call	daah peusa2	
	goto	begin			call	dash	: latter "y"
jar	btfec	portb,5	/ is RB6 low? (pin 12)		call cell	dot. dagh	
	Gata	QTHnnne.	runy awa. spatt end		tml1	dash	
	cali Cali	QRZ? QRZ?	•		call call	pause2 dot	ı figura "5"
	Call	Éros		1	call	dot	•
	call	MyCall MyCall			call call	dot	
	call	PSK			call	dot	
	call coto	K			call	pauce2 dash	: letter "d"
		bagin TH and name	***************************************	1	call	dot	-
Tinane	btfac	postb.7	; is RAT low? (pin 13)	1	call	dot pause2	
	goto	peddle . dash	: letter 'a"		call	dot	· letter *;*
	call	daah		1	call call	dash dash	
	call call	pauma? dash	: letter "y"]	call	dash	
	cali	dot		ļ	return	LP	
	11 11	dash dash			\$ci	browning Try Off	r
	eall.	LF		19/QTI	call call	deah	letter "h"
	cali cali	dash dash	: letter "O"	1	tall	dash	
	=11	det		!	call pall	painse2 dot	; letter "h"
	call	dash pause?			call	dot	
	call	dash	: latter "T"	İ	call call	đợt đợt	
	call cal	pause2 áct	/ lestar MHM	1	call	pause?	
	call:	dot	· Added "R"		call	dot	: letter "a"
	call call	dot dot		1	call call	dash pause2	
	call	Th		1	call	dot	. letter "r"
	call call	£ 8	* **±**		call call	desh dot	
	call	нусти Нусти		1	call	Panes.	
	call	dot	f letter "e"	1	call call	dash dot	: letter "k"
	cell cell	pause2 dot	r latter not		call	daan	
	call	dot		1	call call	pause2 dot	/ letter "s"
	call call	det LP		J	call	dot	
		-		1	call	Pause2	
					call	ರ್ಯ	: latter "v"

to the paddle control. You can manually manipulate the paddle to send either a dash or dot to the output. To recall how it works, please refer to the algorithm chart in the previous article. If no dash or dot inputs were low, the program comes back to "Begin".

Assembly language program

The structure of this assembly program was detailed in the previous article. **Table 2** shows that there are some differences even at the CPU equates. There are two more counters

added. Counter 4 will keep a delay constant for pauses between letters in the message. Counter 5 will store the delay constant to separate words. In the Morse code structure, pauses between letters are three times longer than pauses between dots and dashes

	call	dut. dash	
	cell		
	return	utine "My man	Lg*
HyNasa	oall	dor My man	; lotter "v"
	call	dot	
	call call	desh	
	call call	dot	: letter "l"
	call	daan	: lector "1"
	call call	dot	
	call	pause2	
	CELI	300	; letter tet
	call call	oseh ⊊suso2	
	call	clash	, letter 'd'
	call call	dot dot	
	cell	∴ •	
	teture	routine "QRZ	()* presentation
QRLº	Call	desh	
	call	det	
	call call	daub	
	call	giause2 dol	
	المت جمالا	das;	
	call	pause?	
	call	dans	
	cell cell	dasn dot	
	call	dot	
	cell cell	gauan2 dot	
	2031	dot	
	call	dash dash	
	DALL	dot	
	call call	dot LP	
	return		
PAE	call	dot	
	cali	dash	
	cali cali	dest. dot	
	call	pause2	
	cal:	dat	
	cali	det	
	cal:	Seven? dat	
	Call		
	return St		
ĸ	call	deah	
	call call	dot dask	
banaes.	Subroutin	o og brusen p	retwhen latters
	BOYNE	count 4	: load counter with delay const
ct-chars	decEss	SUMMAR.	. Socrement counter
	reture		. counter 0, and pause
;====== ==	Subrectino acriv	d.121, or banaca pa	r delay constant: load nomiter with delay posst describent counter bot 6
	#D7 WE	counts	: load nounter with delay notest
spapace	docfsz	counts, f	. decrement counter
	return		, counter 0, and pause
1			
	Man	vd partafugt	padola
	Man Sql	ipulating by sutdet	padala
paddle	Man Sel Otisc	set det porta,7 dash?	; is RAI low (dot present)?
paddle	otfac goto call	det	paddle ; is RA2 low (dot present)? . calling subroutine DOT
paddle	otfac goto call	det	; is RAS low (dot present)? . calling subcontine DOT
paddle	otfac gono call gono	dot begin ent dash	; is RAS low (dot present)? . calling subcontine DOT
paddle	btfsc goto call goto Sel btfsc goto	dot begin ear desh parts,3 begin	: 18 RAJ low (dot pressed)? calling subroutine DOT : 18 RAJ low (dnsh pressod)?
paddle	otfsc goto call goto bifsc goto call	dot begin eer deek parth,3 begin dash	: is RAJ low (dot pressed)? calling subroutine DOT : is RAJ low (dish pressed)? : calling subroutina tASH
paddle dash?	otfsc goto call goto bifsc goto call	dot begin eer deek parth,3 begin dash	: is RAJ low (dot pressed)? calling subroutine DOT : is RAJ low (dish pressed)? : calling subroutina tASH
paddle	otfsc goto call goto bifsc goto call	dot begin eer deek parth,3 begin dash	: is RAJ low (dot pressed)? calling subroutine DOT : is RAJ low (dish pressed)? : calling subroutina tASH
paddle dash?	otfsc goto call goto bifsc goto call	dot begin eer deek parth,3 begin dash	: is RAJ low (dot pressed)? calling subroutine DOT : is RAJ low (dish pressed)? : calling subroutina tASH
paddle dash?	otfsc goto call goto bifsc goto call	dot begin eor dash parta,3 begin dash begin the for gener porth,1 d*12 countl	: is RAJ low (dot pressed)? calling subroutine DOT : is RAJ low (dish pressed)? : calling subroutina tASH
paddle dash?	otfac quno quno quno quno sall quno stfac quto call quto salrect baf auvil auvil auvil denfas denfas	dot begin eer dash parts,3 begin dash begin tash begin the for gener porth,1 d/12 countl porth,3 parts,3 auntl,f	; as 7AJ low (dot present)? calling withroutine DOT is FAJ low (dost present)? calling subroutine DASH aming dots EGI-1, dot begans delay constant Luid constant Lind constant is sourt of sourt off decessant commax
paddle dash?	Sel otfac gone call gone call goto call goto call solution but acreate but acreate but acreate but acreate but acreate but acreate but acreate but acreate but acreate but acreate but acreate but acreate but acreate	dot hogin err dash parth,3 begin dash begin dash begin dash begin dash begin dash begin driz countl pretb,3 acuntl,f rptdot portb,1	; as RAJ low (dot pressed)? calling withroutine DOT is RAJ low (done) prossed!? calling submontha thAH acting dots EGI=1, dot begans obelay constant Lad constant Lad constant iscum of sound of sound of sound of sound of sound of sound of sound of sound of sound of sound of sound of sound of
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paddle dash? det	Sel otifac quio cell quio cell quio bifac quio cell quio sel sorvi	dot begin er deal ports,3 begin begin begin begin begin counti d'12' counti ports,3 bounti,f rptdot ports,1 paure ports,1 paure ports,1	; as TAS low (dot present)? calling withroutine DOT is RAS low (does present)? calling subroutine DASH among dota : Bdi-1 det begans tadd comment securation sound of detecement for sound of; detecement for sound of; securation sound of; sound of; securation sound of; securation sound of; securation sound of; securation se
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paddle dash? cot rptdct	Sal bifac dail goto call goto call goto befac goto call goto befac salmont befacille goto call sorted befacille goto befacille	dot begin sor dash parth,3 begin dash begin dash begin dash begin dish perth,1 d'12' beuntl perth,3 purth,3 auntilf rptdot porth,1 pulse porth,1 porth,1 porth,3 porth,3 porth,3 porth,3 porth,3 porth,3 porth,3 porth,3 porth,3 porth,3	; as ZAJ low (dot present)? calling withroutine DOT ; is RAJ low (dish present)? calling subrontine DASH ating dots skil-1, dot begans delay constant ; delay constant ; ded const to Counter; sound of; sound of; sound of; start PAUSE, subrontine staing bearea , Roll-1, Hedi bogans , Roll-1, Hedi bogans ; load constant
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paddle dash cot rptdct paddle	Sulport ontac	dot begin ger deah pertua, 3 begin begin begin begin begin begin begin begin diti diti gerer gere	; as ZMJ low (dot present)? calling withroutine DOT ; is RAJ low (dost pressod)? calling subrottins DASH ating dots : EGI-1, dot begans delay constant ! Ladd const to counter : sound of : sourd off : sourd off : sourd off : start PAUSE subrottins RALLO LOSSES RALLO LOSSES Ladd const to counter : start PAUSE subrottins callo delay constant ! load const to counter : sound off : delay constant ! load const to counter : sound off : decirement counter : sound off : decirement counter : tor 3 : ESI-3, sed dash : start FAUSE subrottins
paddle dash dot rptdct pridct pridch	Sul ontine to the contine to the con	dot begin ger deah pertua, 3 begin begin begin begin begin begin begin begin diti diti gerer gere	; as ZMJ low (dot present)? calling withroutine DOT ; is RAJ low (dost pressod)? calling subrottins DASH ating dots : EGI-1, dot begans delay constant ! Ladd const to counter : sound of : sourd off : sourd off : sourd off : start PAUSE subrottins RALLO LOSSES RALLO LOSSES Ladd const to counter : start PAUSE subrottins callo delay constant ! load const to counter : sound off : delay constant ! load const to counter : sound off : decirement counter : sound off : decirement counter : tor 3 : ESI-3, sed dash : start FAUSE subrottins
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paddle dash? dash? dash rptdck rptdck rptdsh rptdsh palse	Sal obtase done of the call gots of the	dot begin sor dash begin sor dash begin dash begin dash begin dash begin dash dash begin dash dash begin dash	; as TAJ low (dot present) calling subroutine DOT is RAJ low (dneh prosesod) calling subroutine DASH sammy dota selic, dot begans delay constant lead constant to counter decreasent comman not D RBJ-C, and dot start PAUSH subroutine sting dota lead constant committer sting dota start PAUSH subroutine sting dosans ABJ-1 Healt begans losd constant losd constant for decreasent committer sound on sound off decreasent committer to J rBJ-A, and death start PAUSE subroutine sting dotated to committer decreasent committer idead counter delay constant ically constant ically constant decreasent
paddle dash? dash? dash rptdck rptdck rptdsh rptdsh palse	Sul ontine to the control of the con	dot begin sor dash begin sor dash begin dash begin dash begin dash begin dash dash begin dash dash begin dash	; as RAJ low (dot present)? calling withroutise DOT ; as RAJ low (does present)? calling subroutine DARM aming data skil-1, dot begans delay constant land const to counter; sound off sound off sound off state PAUSE subroutine RAJ-1, Hadd begans delay constant; load const to counter; state PAUSE subroutine and off delay constant; load constant load constant counter; sound off deciminant secuntar; sound off deciminant secuntar; tor J sound off deciminant secuntar; tor J state FAUSE subroutine
paddle dash? dash? dash rptdck rptdck rptdsh rptdsh palse	Sal obtase done of the call gots of the	dot begin sor dash begin sor dash begin dash begin dash begin dash begin dash dash begin dash dash begin dash	; as TAJ low (dot present) calling subroutine DOT is RAJ low (dneh prosesod) calling subroutine DASH sammy dota selic, dot begans delay constant lead constant to counter decreasent comman not D RBJ-C, and dot start PAUSH subroutine sting dota lead constant committer sting dota start PAUSH subroutine sting dosans ABJ-1 Healt begans losd constant losd constant for decreasent committer sound on sound off decreasent committer to J rBJ-A, and death start PAUSE subroutine sting dotated to committer decreasent committer idead counter delay constant ically constant ically constant decreasent

in the letter. It is equal to the length of a single dash. The duration of the pause between words is equal to three dashes or nine dots.

After you are familiar with assembly programming, you can easily understand what has happened in the lines preceded by labels "Start" and "Begin". After initialization of counters (merely clearing their memory cells), the program

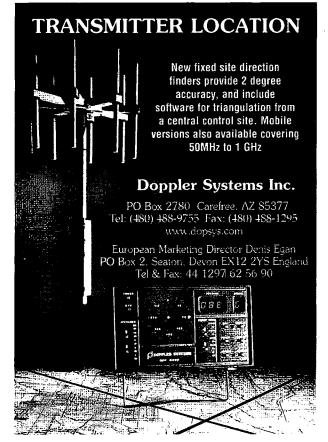
Table 2. An assembly language program for a modified PIC keyer.

Name	Description
C1, C3	10 μF 25 V electrolytic or tantalum (DK P5148-ND)
C 2	100 nF ceramic (DK P4924-ND)
C4	15 nF ceramic (DK P4905-ND)
LS1	Piezo buzzer element (DK P9924-ND)
Q1	2N2222 or any general purpose NPN silicon transistor (DK PN2222ADICT-ND)
RP1	25k potentiometer (DK CT2266-ND)
S1	Any type CW keyer paddle
S2-S6	Any type push-button switches (e.g., DK P8006S-ND)
U1	78L05 small 5 V positive regulator (DK NJM78L05A-ND)
U2	PIC16F84 microcontroller (DK PIC16F84-04/P-ND)

Table 3. Parts list.

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starts to examine five port B inputs. The first step is labeled "MainCQ". If RB2 is still high (button unpressed) the next line instruction, "Goto CQDX", skips over the CQ message and examines input RB4.

If RB2 was really low, the program will ignore the second line and continue from the third one. Actually, there are numerous subroutines being called one by one while forming the message. At first, subroutine CQ was called three times. Next is called subroutine "from", which in fact generates the word "de" in the radio message. (It is impossible to name this subroutine as "de", because this combination of letters is reserved for the PIC microcontroller and is forbidden for use as the label or subroutine name.)

Then subroutine "MyCall" called three times, "PSE" once, and "K". The first CW message is completed, and the instruction "Goto" returns the program to "Begin."

I hope this gives you the idea of how any message is formed. You may examine how it is organized in the "CQDX", "CQTEST", "QRZ," and "OTHname" portions of this program. It is really very easy. Subroutines included here also invoke other subroutines for dots, dashes, and pauses.

Please pay careful attention to subroutines "MyCall," "MyQTH", and "Name." You must understand how to change the sets of dots, dashes, and pauses to make your callsign, OTH, and name available. Remember that you have to call each time the subroutine produces one dot, dash, or pause. These subroutines are only what you need to change for correct operation of this keyer at your station. First, merely write your callsign, OTH, and name in Morse code, using dots and dashes. Then substitute them by instruction "Call" and appropriate subroutine name. Please keep in mind that pauses between dots or dashes are included into both subroutines generating dots and dashes (at their end). This means that you do not add any pause after Morse code elements.

Subroutines "Pause2" and "LP" provide pauses between letters and words in the messages. The required duration of these pauses was achieved by appropriate selection of the delay constant's values.

The part of the program labeled "paddle" is almost the same as what was in the original keyer program. One difference is in subroutine "Pause." The delay constant was changed from 14 to 9. Why? Because when the keyer is operating from the paddle any time the program is checking five microcontrollers' inputs and uses 5 processor cycles more each time. This, of course, will increase the pause duration between dots and dashes. To compensate for this, the delay constant was decreased.

Schematic diagram and construction

Fig. 2 shows the schematic diagram of the improved PIC keyer. The only differences from the original keyer are push-buttons S2-S6. They are normally open, and are intended to pull the PIC's inputs to ground. This will activate one of the previously determined messages.

The new keyer is assembled on a small 35 x 35 mm single-sided printed circuit board (Fig. 3). Please note that pads are provided for connecting the push-buttons. It will give you a variety of choices in your selection of pushbuttons, paddle, and cabinet for final construction.

Summary

Building this simple keyer will help you gain knowledge and skills through study, experimentation, and construction — and you will end up with a very useful station accessory as well! Like most amateur radio projects, this project is ripe for further improvements and modifications. Keep in mind that the program described in this article utilizes only a very small part of the PIC16F84's capabilities.

I want to express my gratitude to my friend Dave Evison W7DE for his patience in reading and doing some preliminary editing of this article.

Charles R. Solomon K4CRS 172 Lakeshore Dr. Harriman TN 37748 [Charons@bellsouth.net]

10m Junk Box Amp

More tube-type fun!

A few months ago, I was trying to communicate with my son Mike KC4DQR on 10 meters. While he could hear my 100 watt rig, I could never hear his 25 watt Realistic HTX-100. We live about 50 miles apart, and that was just a little too far away for his 25 watt ground wave and dipole antenna to get through. I figured there must be a solution to this problem, and started to dig into the ol' junk box. Since Radio Shack sold the HTX-100 to lots of hams, I decided to share with you my solution, the 10m Junk Box Amp.

wanted the amplifier to be easy to work with, simple to build, and rugged. With this in mind, I chose a tube-type circuit. Since the old 807 tubes are still quite popular as drivers in many AM broadcast transmitters, they are easy to come by and fairly inexpensive. If you use two of them in a parallel configuration, they also will produce about 100 watts, the power I was looking for. Another plus was that my junk box contained two of them!

Construction

The hardest part of the construction was building a suitable chassis out of a piece of aluminum which I also happened to have on hand. After much

beating, hammering, drilling, and a few pop rivets, I had a 17- x 5- x 12-inch box that looked a lot like a chassis. Instead of building on the outside like most of the older tube-type projects, I built the amplifier inside the box.

The box of junk produced a suitable power transformer with a secondary of 550 volts @ 450 mA, which was rectified through a bridge circuit consisting of eight 2.5 amp, 1000 PIV diodes. I wanted it to last!

The most expensive part of the project turned out to be the filters. I used three 100 μ F @ 450 VDC in series. Such capacitors are not easy to lind now, since most projects are solid state and use low voltage capacitors. These little jewels cost \$7.50 each.

The three resistors, R3-R5, serve to equalize the voltage across the capacitors, and also as bleeder resistors to discharge the capacitors when the unit is turned off. The high voltage circuit produced a no-load voltage of

590 volts, and about 560 volts under load.

A word of caution: Keep your fingers clear of this when the unit is on. These voltages, producing nearly half an amp, can be dangerous. Practice safety at all times.

In order to make the unit as efficient as possible, I used a tuned circuit to drive the tube's grids. This consists of LI, L2, and C7. Since tubes like to see negative voltage on the grids. C6 was used to block the negative DC from the tuned circuit. To generate the negative grid bias voltage, I used a 6.3 volt filament transformer connected in reverse to the 5.0 volt rectifier filament winding, and used what was the primary winding as the supply. This was rectified by another bridge connected with the positive side to ground, and filtering the output with C2's positive lead to ground. The voltage produced here was exactly what was needed, biasing the tubes to cut off when no signal was applied. This prevented the need for any kind of switching to turn the amplifier off and on, since the plate current remained at zero when no signal was applied to drive the circuit.

cuit produced a The resistor R2 provides a small no-load voltage of load to keep the voltage stable, and C1

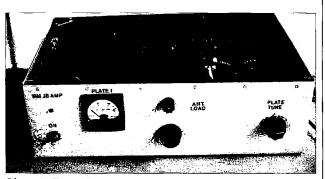


Photo A. Front view.

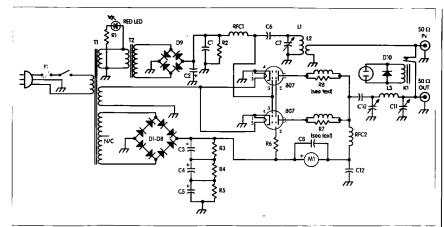


Fig. 1. Schematic.

shorts any RF to ground that may have sneaked through RFC1. The screen grids were supplied through R6, which gave a little higher voltage than the specs on the tube called for, but since you can run the plate voltage at up to 750 volts, this did not seem to be a problem.

The parasitic suppressors in the plate circuit consist of 56 ohm, 2 watt carbon resistors, with three turns of #16 wire wound around them. I used the TLAR method to figure these values. What's the TLAR method? That Looks About Right! The output is a standard pi network consisting of CIO, CII, and L3. I used a door knob capacitor, C9, to block the high voltage off the pi network, and antenna. The RF choke, RFC2 and C12, block the RF from the power supply. The plate current meter is a 300 mA unit, shunted by C8 for RF suppression.

HTX-100 Mod

Since it is not practical to design a simple RF sensing circuit that will respond to an SSB signal, I decided to modify the HTX-100 with a keying circuit for the 10m JB Amp. With the bottom cover removed, I looked for a place on the PC board that would go high when the mike was keyed, and remain high. Several places were found. I used a triangular land in the left-hand corner at the "x", which

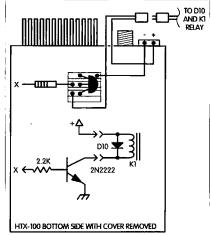


Fig. 2. Keying circuit modification for the Realistic HTX-100.

went to a positive 12 VDC when the mike was keyed.

In order not to place any significant load on the HTX-100 circuit, I coupled that point through a 2.2k 1/2 watt resistor to a simple relay driver using a 2N2222 NPN transistor. The transistor was mounted on a small PC board etched with only three strips, as shown. From the collector a wire was routed through an existing hole in the rear of the HTX-100, and a second wire from the (+) side of the power plug on the radio was routed through

Continued on page 18



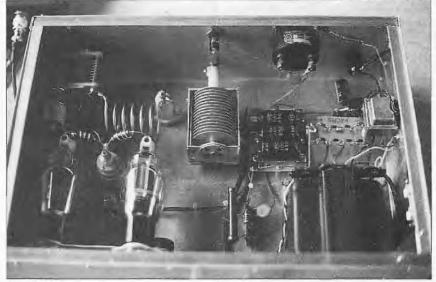


Photo B. Interior view.

10m Junk Box Amp continued from page 17

the same hole and attached to a plug for quick disconnect.

The mating plug from the amplifier feeds the relay K1. A IN914 diode was connected across the relay to act as a shorting device to protect the 2N2222 from voltage generated by the KI coil when the relay is turned off.

Keying the radio turns on the 2N2222 and closes the relay in the amplifier. Since the radio's speaker is mounted on the bottom cover, care must be exercised to mount the transistor's circuit board so that it doesn't short against the back of the speaker.

Tuneup

Tuneup was straightforward, fir tuning the pi network for maximu power into a Bird wattmeter an dummy load, then tuning C7 in the grid circuit, and retouching the pi ne work. When properly tuned, the ampl fier produced about 95 watts output with the plate running about 250 mA Of course, this was done with the radi in the CW mode. All amateur transmi ting equipment must be able to ser CW — ARRL rule number 1!

During the 1999 Field Day contest, used this system to make many 10 met contacts that ranged from Florida

Continued on page 4



Photo C. Complete setup.

	WIGHT				
L2	3T #18 wire 1/2-in, diam, spaced 1 turn width on cold end of L1				
L3	5.5T #10 wire 1-5/8-in, diam. 2 in. long				
M1	0-300 mA meter				
R1	200 Ω 1/2 W carbon				
R2	47 k, 2 W carbon				
R3–5	100 k 1/2 W carbon				
R6	2 k 5 W wirewound				
R7-8	56 Ω 2 W carbon				
RFC1	2.5 mH RF choke				
RFC2	2.5 mH 600 mA RF choke				
T1	117 VAC primary, secondary 550 VAC CT @ 300 mA, 6.3 VAC @ 2A, 5.0 VAC @ 2 A				
T2	117 VAC primary, 6.3 VAC secondary, hooked up in reverse with 6.3 side connected to 5.0 output of T1				
	Miscellaneous				
	SPST toggle switch				
	2 x SO-239 connectors				
	Red LED				
	2 x 807 tubes				
	Line cord and plug				
Any kind of insulated 2-conductor plugs (keying circuit)					
	5 x 5-terminal solder lugs				
	5 x 5-terminal solder lugs Porcelain standoff				
2					

Parts List

0.01 μF @ 1 kV

50 μF @ 150 VDC

100 μF @ 450 VDC

0.01 µF @ 1 kV

50 μF variable 500 pF door knob

150 pF variable

1000 pF variable

1 kV PIV @ 2.5 A

200 V PIV @ 1A

SPDT relay 12 VDC coil

6T #18 wire 1/2-in. diam. spaced 1 turn

1N914

Description

Part

C1.

6, 8,

C2

C6

C7

C10

C11

D1-8

D9

D10

K1

L1

C3-5

Vaya Con (Ra)Dios

The radio amateurs of Spain — part 2: Mallorca and a side trip to the Principality of Andorra.

During my tour of Spain, I took a side trip to visit the amateurs of the island of Mallorca in the Balearic group. Xavier EA3ALV, editor of the Spanish CQ Radio Amateur magazine, who had translated and published several of my travelogues, called up Guillem EA6YG (Photo A) and set up a meeting for me.

rom Barcelona, I took a ferryboat of the Buquebus company, and in about three hours I arrived to Palma de Mallorca. The round trip tickets were 16,300 pesetas, about \$110 at the rate of exchange of 148 pesetas for a US dollar. There is another company, the Transmediterranea, which is cheaper, but the journey takes twice as long. There were several monitors on board to show the itinerary but none of them worked properly. You could buy some food on board but it was expensive.

A worried woman asked the captain: "Ferryboats like this do sink often?" "No Madame, just once!" was the reply.

Many hams go to Balearic Islands to work in contests or just operate during their vacation.

I heard of one wife who told her DXpeditioner husband: "My dear, I am always worried when you leave on a trip."

"Don't worry, sweetheart, I'll be home before you know it."

"That's exactly why I'm worried!" said the wife.

I had wanted to see as many hams as possible and return the next evening, but I could get return tickets only after three days because it was during

> Semana Santa, a weeklong religious holiday, and vacationers were returning home by the thousands.

> As soon as I got off the boat, I spotted Guillem with his cap showing his callsign EA6YG, and his friend José-Maria EA6DO. Guillem took me to his house in Inca.

northeast of Palma, where I stayed three days while he was driving me around to various cities to meet the local hams. Guillem was licensed in 1983, and nowadays is not as active as he used to be. He has several jobs, such as hotel receptionist six months a year during the tourist season. He looks like the captain of a pirate ship, so he may indeed have something else

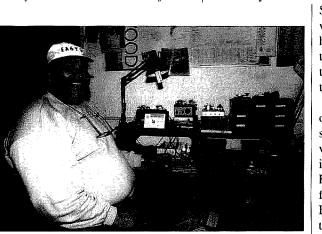


Photo A. Guillem EA6YG was my guide in Mallorca.



Photo B. José-Maria EA6DO is a retired air force communications major.



Photo C. Genis EB6WS and Gabriel EA6JT operate Inca club station EA6URI.



Photo E. Gigi EA6HL, Palma de Mallorca.

to do when the hotel is closed. His most important work is in manufacturing telegraphic keys. During the years, he had made about 40 different types: straight keys, iambic, semiautomatic, iambic with electronic memories, etc., under the name of Llaves Telegraficas Artesanas.

Guillem has a vertical for 10-15-20 meters, a multiband dipole for 10 to 80 meters, and a discone for 30 to 1,300 MHz, used for 2 meters. On the low bands, he works only CW. He is not connected to the city's power line; he is using solar panels and a generator. Also, instead of using the city's water supply, he has wells on his property. Guillem EA6YG has QSL cards and his E-mail is: [llatelar@arrakis.es].

We all went to Palma to see the station of José-Maria EA6DO, a retired air force communications major (**Photo B**). He started in amateur radio in 1949, the year when, after World

War II, hamming was again authorized in Spain. He has a vertical for 10 to 40 meters from Butternut, a TH3-MK3-type 3-element yagi for 10-15-20 meters, and a dual-band vertical for 2 meters and 70 cm. His rig is a Drake TR-7, running 150 W, mostly on CW. The walls of his shack are covered with awards; I also noticed some military medals from his previous occupation, a framed photograph of His Majesty Juan Carlos, King of Spain, EAØJC, and his QSL card. As do virtually all the hams I visited, José-Maria also has QSLs.

In Mallorca, I saw many windmills. The mills were all in ruins; just the wind was still good.

Guillem took us to his radio club in Inca with a station EA6URI (**Photo** C). There we met Gabriel EA6JT, the club's president, and Genis EB6WS, the secretary. They run 100 W, use a computer, and have OSL cards. Need-

less to say, the CW operators use keys made by Guillem EA6YG. The club has 28 members; some of them come to meetings on Thursdays from 8 p.m. to sometimes midnight.

Gabriel EA6JT, licensed in 1981, has a photo studio close to the club. He works RTTY and color SSTV, and is on packet radio. His brother Juan EA6JS lives in Inca, while his other brother Oswaldo EA6AUL is in Palma.

Genis EB6WS, licensed in 1989, is a teacher of the Catalan language. Having a "B" license, he can operate only on VHF and UHF, meaning from 2 meters up.

Guillem organized a common dinner in a restaurant and a bunch of hams showed up: Mari-Carmen EA6ADY from Porto Colom (Photo D); Gigi EA6HL (Photo E) and her husband Bernardo EA6HI from Palma; Miguel EA6SK, a chief electrician from Inca; Mateo EA6BH (Photos F and G) from Palma and Bahia Azul (has



Photo D. Mari-Carmen EA6ADY, Porto Colom.

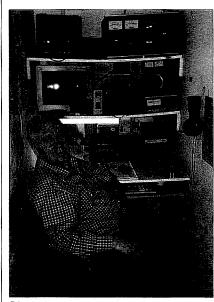


Photo F. Mateo EA6BH, Bahia Azul and Palma.

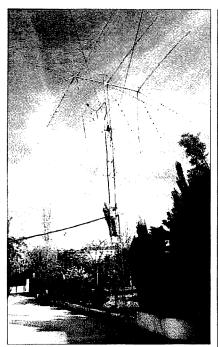


Photo G. EA6BH is hands-on when it comes to tower climbing.

two residences); Gabriel EA6JT and Genis EB6WS, both from Inca: and others. I was advised to order "Lomo con Col" (pork loin with cabbage) boy, I did, and I regretted it. I did not like it at all. I even wrote the name in my notebook, to remember not to ever order it again in my life. Using a moment of animated discussion and lack of general attention, I slipped my plate to a nearby table.

After dinner, we continued with the visits. We went northeast from Inca to La Puebla, or Sa Pobla in local spelling. There we saw Gabriel EA6HY, a

teacher of electrical sciences, licensed

Photo H. Gabriel EA6HY is an electrical sciences teacher.

in 1978 (Photo H). Gabriel has a Hy-Gain yagi for 10-15-20 meters, and a dipole for 40 and 80 meters. He uses a TS-520S with a remote VFO and antenna tuner, has various test instruments, and shows off homemade accessories like his power supply. He works on SSB, running 129 W; for RTTY, he is using an old Lorenz electromechanical teleprinter. Gabriel EA6HY has a nice, colorful OSL card.

On our way to see another ham, in Manacor on the eastern part of the island, we met Roberto EA6ABI (Photo I), a sergeant in the Guardia Civil traffic department who's usually roaming the highways on his motorcycle. Here I have to mention that the roads in Spain are in excellent condition. Roberto was licensed in 1964; he came from Madrid, where he had an EA4 callsign. He works SSB on 15 and 40 meters, and on 2 meters with his local friends.

I could not enter the Guardia Civil building where he has his station, so I photographed him in front of it, showing his antenna in the background. I also took his picture near his car having his callsign on the back window: EA6ABI. In Spain, the hams are not allowed to have license plates with radio amateur calls; some hams, proud of the service they provide, place their callsigns on their cars, anyplace they can. In case of Roberto, any place he wants — who will start an argument with a sergeant in the Guardia Civil? Roberto has OSL cards with the emblem of the Guardia Civil: a sword and the fasces, which is a bundle of rods bound together about an ax with the

> blade projecting, suggesting their roughness.

We stopped for a soft drink, and Tony EB6HZ, who happened to walk by, joined us.

A traffic cop stops a speeding car and starts to write a ticket. The woman driver says:

Cont. on page 22

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Photo I. Roberto EA6ABI sports his callsign in his rear window — no ham plates in Spain!



Photo J. Guillermo "Billy" EA6ABN is a plumber who makes good connections all around the globe.



Photo K. Michel C31MO is an accountant in Andorra; Joan C31US, co-owner with wife Josefina C32MV of a toy store, is president of the Radio Amateur Union of Andorra.

Vaya Con (Ra) Dios continued from

continued from page 21

"I am the wife of the richest man in town and I am in a very big hurry!"

"I am very impressed Madame," says the cop. "And I am writing as fast as I can!"

Have you heard this?

In one big European country, one million people drive their cars while they are intoxicated. Fortunately, this number is getting smaller every day.

Finally, we arrived at our destination in Porto Cristo and visited Guillermo, or Billy EA6ABN (Photo J). Licensed in 1984, Billy is a plumber who likes to make friends all over the world using ham radio. He has a 3-element yagi for 10-15-20-40 meters from Walmar of Argentina, and a double wire dipole for 12 and 17 meters. Billy's rig is a TS-520S; he is running 100 W on SSB and CW. He has worked 232 DX entities and has QSL cards. I saw on the wall of his shack maps, charts, and a framed OSL card from EAØJC.

In Porto Colom, in the southeast corner of the island of Mallorca, we saw Mari-Carmen EA6ADY, whom we had met earlier at the common dinner. She is handicapped and confined to a wheelchair, but is quite active as a radio amateur. She was licensed in 1996 after she saw her cousin Paco EA3AUL operating in Barcelona. Mari-Carmen has an all-band, 6 to 80 meters, Diamond vertical antenna, a dipole for 40 meters, and another one for 80 meters. She is using an IC-735 with an AL-811 Ameritron amplifier, works only SSB, and likes to talk with friends but speaks only Spanish. She has received more than 30 awards and has QSL cards.

In Palma we visited Gigi EA6HL, a secretary in a commercial company, and her husband Bernard EA6HI, a radio broadcaster, both licensed in 1979. They operate mostly on 20 meter SSB. Gigi has worked 100 entities; Bernard is doing better with 150. They use a computer and have a common QSL card.

Oh, the ladies of Spain! I used to dream about them when I was younger. Now I forgot what I was dreaming about. I met several lady operators during my travels; some were attached to man operators, others were independent.

A doctor calls up one of his patients with the results of a test.

"Senora Virginia, I have very good news for you!"

"Please doctor, don't call me Senora, I am a Senorita ..."

"In that case, Senorita Virginia, I have some bad news!"

In Bahia Azul, we saw the second home of Mateo, or Teo, EA6BH, His main residence is in Palma. Mateo, licensed in 1966, is a DXer; he needs only five entities to have them all. In Palma, he has a TH3-MK3 Yagi for 10-15-20 meters, and a dipole for 40 and 80 meters. Rigs he has plenty: TS-850S, TR7, TL-922, IC-229, and TS-440S. In Bahia Azul, he has more room, so on a tall tower Mateo installed a 4-element quad antenna for 10-12-15-17-20 meters, and on another tower installed on top of his building he has a 5-element monobander for 20 meters from KLM. He

also has a 4-element Hy-Gain yagi for 6 meters, a dipole for 40 and 80 meters, and a vertical for 160 meters. He uses a Kenwood transceiver and an AL-1200 amplifier.

Mateo EA6BH operated several times from Equatorial Guinea as 3C1DX. He also had a license and the assigned callsign of 3CØDX for Annobon, but first he could not go because of transportation problems, and later because the government canceled the license. Mateo has two types of nice OSL cards.

I heard of a DXer who, all excited, calls up his friend and asks:

"Did you hear the station from North Korea?"

"I certainly did!" assures the friend. The DXer checks all the bands on all the modes on all the receivers he has, and turns his 11-element log periodical in every which way, but he cannot find the station from North Korea. He calls his friend again:

"When did you hear the station from North Korea?"

"Oh, it could be a week ago!"

In Manacor, Guillem took me to the Majorica "pearl factory" which is nothing more than a huge showroom where busloads of tourists go to spend their money. Without any doubt, the guides bringing them there get a percentage of the sale. While the buyers never see the factory, they have to be sure that there is one because the pearls are man and machine made, and they never came even close to an oyster. I knew all that, but my wife did not, and she gave me strict instructions to bring home some pearls. As I was not willing to go to the South Pacific and dive for them, the only alternative was to get them in a "pearl factory." The only bright side for me was that when I left Barcelona returning home, at the airport I claimed and received the sale tax, called IVA, I was charged. I got much less than I thought I would, but I had enough to pay a taxi in New York. Otherwise I would have taken the bus.

Everything you buy in Spain is subject to the 16% IVA tax — sometimes it's included in the sale price, while other times it's added to it. Many

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Photo L. Carlos C31UA owns the Hotel Festa Brava in Andorra la Vella.

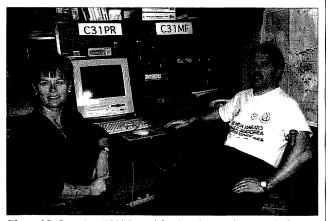


Photo M. Paquita C31PR and husband Manel C31MF share a common QSL card.

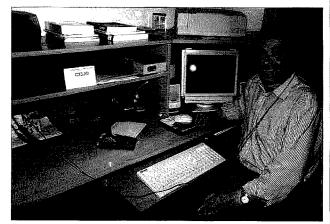


Photo N. José C33JO is a manager for a building construction company.

Vaya Con (Ra) Dios continued from page 23

prices are quoted both in pesetas and in "Euros."

Visiting the amateurs of the island of

up a ham in Manacor to arrange a visit. The ham knew that we would be in his town on a Saturday, when it would be easy for us to see him, but he insisted we come on Sunday at 12 noon. We took the long ride, and at the agreed-upon day and time we arrived at his place. Guillem rang the bell for about 10 minutes, but there was no answer. We waited around another 20 minand utes. then Guillem called him on his mobile phone. The ham answered by saying that he had just woken up, and would open the door in 10 minutes. We waited another half an hour, but still the door was not opened, so we left. On our way back to Inca. Guillem called the guy again. He said that he had seen us from his terrace, and if we wanted to come back, he would

Mallorca was fun

and easy. There

was one single in-

stance when we

were not success-

ful. Guillem called

open the door. We declined the invitation.

Talking about smart hams: One of them wanted to measure the height of his tower, but could not figure out how to do it.

Another ham said: "Let's lay it on the ground and measure it!'

"That is no good," said the first. "I want its height, not its length!"

On my last day in Mallorca, Guillem EA6YG took me to the harbor in Palma. I again boarded the Buquebus ferryboat, and in about three and a half hours, I was back in my home port of Barcelona.

Speaking of ferryboats again: A tourist arrives at the pier when the boat is just leaving. A man tells him to jump aboard. The tourist hesitates, the man gives him a big push, and the tourist lands on the deck, hits himself, and passes out.

A couple of minutes later, he is revived, looks at the far away pier, and exclaims: "Gee, that was a pretty good jump, if I do say so myself!"

An editor once told me that to write a good story, you have to do three things: write a good beginning, write a good ending, and make sure that the two are fairly close together. As I recheck my Mallorca article, I realize that I have failed in all three. Well, there is always a next time ...

Andorra

When I planned my voyage to Spain, I thought that, being already in the neighborhood, I could also visit Andorra. This tiny little country, with its seven districts, has a population of over 60,000. The official language is Catalan. It has a parliament whose its only female member is a radio amateur: Rosa C31MN. Not bad for a country that gave its women the right to vote only in 1970.

The country itself, a member of the United Nations and the Council of Europe, is called the Principality or the Princedom of Andorra, but it does not have a "prince." It has two sovereigns: the bishop of Seu d'Urgell and the president of France, none of them being "princes" as we would think of it.

While preparing the trip, I wrote to a couple of amateurs asking their cooperation in meeting local hams. I received an enthusiastic answer from Michel C31MO, member of the executive board of U.B.A., the Radio Amateur Union of Andorra, saying that he would arrange the visits.

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From Barcelona I took an early morning bus, paid 2,435 pesetas (about \$16.50), and, after going through the over-3-mile-long Cadi Tunnel, arrived in three hours at Andorra la Vella, the capital city.

A man is asking a bus driver: "Can a bus like this go on a winding mountain road at 100 miles an hour?"

"Of course it can, Sir," says the driver. "Once."

Another one:

A man is desperately running after a bus going downhill. A bystander yells at him: "Why are you running? Another bus is coming soon!"

"Yes, but I'm the driver for this one!" yells back the runner.

I was ready to call up Michel C31MO (Photo K) when he showed up and recognized me by my cap having my name and callsign. First we went to his house in Santa Coloma, built on a hillside with his 58-foot tower installed 32 feet higher than his building. Michel C31MO is an accountant, and his wife Rosa C31MN works in an attorney's office; both were licensed in 1979. At the time of my visit, Rosa, member of the parliament, was in Brussels at a meeting of the European Interparliamentary Union.

Their antennas are an 8-element yagi for 10-12-15-17-20-40 meters from Force 12; a 9-element vertically polarized yagi for 2 meters; and a separately installed vertical for 2 meters and 70 cm. They use (mostly him rather than her, because Rosa is not very active) an IC-738, a 3 kW PEP Tremendus II amplifier made in Spain by Ulvin, and an MFJ Versa Tuner V capable of loading that high power.

Michel C31MO has worked over 200 DX entities, works SSB and RTTY, has packet cluster, and for logging is using Swisslog.

Michel's favorite words are "no problem," meaning "it can be done." It happened that the same words were my least favorite ones, because I heard too many times "QSL no problem" and never received any cards from the frequent users.

Talk about problems ...

A clerk entered his big boss's office, stuck out his tongue at him, threw on the floor all the papers from his desk, ripped out the telephone cord, and | several awards. The Union has a Web pulled the waste basket over the boss's head.

Then his fellow workers stopped him, saying: "José, we were just kidding — you did not win the national lottery!"

In Andorra, there are three classes of personal licenses and one club license. Class 1 has the C31 prefix, class 2 has the C32 prefix, and class 3 for Novices has the C33 prefix and entitles the holder to work on VHF and UHF bands. Club stations, and there is only one that I know of, are using C37 as the prefix. There is no power limit for the class 1 licenses, which makes sense in the Andorra's particular situation, where most of the stations are surrounded by 1,000-2,000-foot-high mountains. While 2-3 kW are helping push the signal over the mountains, they don't do any good for the incoming ones.

We went to Andorra la Vella to see the radio club of the Radio Amateur Union of Andorra, which has a couple of rooms: one for the radio station using the C37RC and C37URA calls and for the OSL bureau, and another one for meetings and courses. The club awards the 5 W 5 diploma for working five Andorran stations. each on a different band. There are 128 licensed hams in Andorra. and they run three open repeaters on 145.700(-)145.625(-), and 438.750(-) MHz. The club has several transceivers and two computers, and is nicely

decorated

with

page at [http://www.sta.ad/ura], and its E-mail address is [ura@andorra.ad].

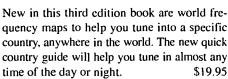
Next we saw the station of Joan





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Photo O. Jordi C31JI manages an electronics store and works only on SSB.



Photo Q. Luis C33LM, Andorra la Vella.

C31US, the president of the Radio Amateur Union of Andorra. Joan was licensed in 1984. He and his wife Josefina C32MV, own a toy store called "Tic Toc" right in the business center of Andorra la Vella. Joan C31US has worked over 150 countries only in SSB. He has an FT-1000, is running 200 W, and uses a computer. His amplifier is ... what else but a Spanish-made Ulvin, which produces several kWs. His antennas are: an 8-element yagi for 10-12-15-17-20-40 meters from Force 12, a dipole for the 40 and 80 meter bands, and a vertical for 2 meters and 70 cm.

I heard a story:

Two heavyset men are walking up the street.

A young rascal is yelling at them: "You are fat, you are fat!"

One of the fat men gives the rascal 100 pesetas, and the other one, surprised, asks the giver: "He called us fat, why did you give him 100 pesetas?"

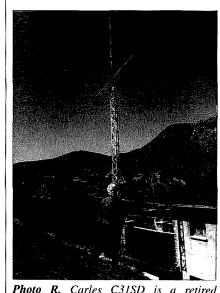
"Because now he thinks he can get some money if he calls somebody fat," the first replies, "and one of these days somebody will beat the hell out of him!"

Michel took me to Carlos C31UA (**Photo L**), to his second house, way up on the mountain, at 6,400 feet

above the sea level. There he has a TS-430S and a TS-690S, followed by an Ulvin 3 kW. amplifier for the lower bands, and a TS-790E for 2 meters and 70 cm. Carlos has several antennas on three towers: The first tower, a 48-footer, has two 5-element monobanders, one for 10. the other for 20 meters. His second tower, a 32footer. has 5-element monobander for 15 meters, and a 2element monoband yagi for 40 meters. His third tower, again a 48-footer, has a 6-element quad for 2 meters to connect him with his main house down in the valley. A delta loop for 80 meters and a 15-element yagi for 2 meters complete his antenna farm.

Carlos C31UA is a senator in the municipality of Andorra la Vella; I think that is equivalent to our city councilman. He owns and runs Hotel Festa Brava, where he has a 4-element yagi for 10-15-20 meters from KLM, a 5-element yagi for 6 meters, and an inverted V for 40 meters. Down there he uses a TS-690S. Carlos does computer logging and he made over 300 DX entities.

In Anyos, we saw Manel C31MF (**Photo M**), a bank employee licensed



banker.

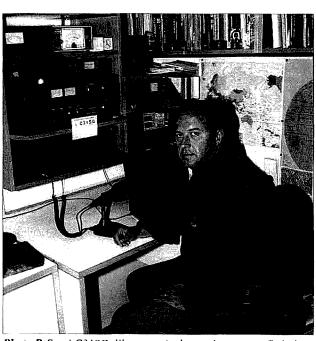


Photo P Santi C31SG, like many Andorran hams, uses Swisslog.

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in 1982. With a TS-930S and a TL-922 amplifier, he is running 500 W and works only on SSB. He has a vertical Hustler antenna for 10-15-20-40-80 meters and a log periodic installed vertically. His wife, Paquita C31PR, was licensed in 1983. They do computer logging with a home-made program. They have a common OSL card for both of them.

In Les Escaldes, near the radio club, lives Jose C33JO (Photo N), a manager for a building construction company, licensed in 1996. His antenna is a Cushcraft R7000 for 10-15-20-40-80 meters, his rig is a TS-570D, and he works only on SSB. He uses a computer with Windows 98, and logs with Swisslog, a program which seems to be widely preferred by Andorran hams. He has QSLs, as all C3 amateurs I visited have.

Also in Les Escaldes we saw Jordi C31JI (Photo O), licensed in 1996, after he saw his friend C31MF operating his radio. Jordi is an administrator of an electronic store - I think we would call that a manager. He has a Cushcraft R7, and for a rig he uses an FT-840 with 100 W. Works only on SSB, has over 140 DX entities, and for logging he is using — guess what? — yes, the Swisslog.

A ham sold his friend an old transceiver, but he did not receive payment for a long time. After a while, the ham tells his friend: "I see you are not going to pay for the transceiver, so I'll make a gift of it to you."

"No way," says the other ham. "Sooner or later I'll pay you, but if you feel like making a present, please give me a power supply to go with it!"

Continuing the visits, Michel took me to Andorra la Vella to see Xavier C31PM, a computer and office equipment salesman. Xavier has a neat little station with a computer using Windows 95. He started as a CBer, but in 1996 he got his ham license. He has a vertical 5-band Hustler antenna, works DX with an FT-890 using 100 W, but only on SSB. Xavier also has QSL cards.

Tony C31 AL is the brother-in-law of Xavier C31PM. Licensed in 1996, Tony is a heavy machine operator. He

has an IC-707 feeding 100 W into a Spanish-made 3-element yagi for 10-15-20 meters or a wire dipole for the 40 and 80 meter bands. Tony has packet and DX cluster, uses Swisslog for logging, operates only SSB, has over 70 DX entities, and has QSL cards.

Also in Andorra la Vella, we visited another Tony, this one is C310F. Licensed in 1981, he installs and maintains heating systems. Tony has a rotatable dipole for 10-15-20-40 meters, and a TS-940S transceiver followed by a TL-922 amplifier capable of supplying 2 kW PEP. He works SSB, SSTV. and CW on keyboard, is a DXer with over 300 entities, and has the 5BDXCC and scores of other awards. He worked EAØJC, probably one of the second operators, José or Isaias; few ever had the chance to work with the first operator, HM Juan Carlos, the King of Spain. Tony's wife Ermitas C32VA was licensed in 1987. Tony has QSL cards; I had a QSO with him and we exchanged cards. Ermitas doesn't have any.

Also in the capital city, we went to see Santi C31SG (Photo P). He was licensed in 1987 and is working in banking. He has an FT-1000 — what else would a banker use? For an amplifier, Santi uses a TL-922, feeding 2 kW PEP into a 2-element yagi for 10-15-20 meters. He has over 180 DX entities worked, only on SSB. Santi is using the Swisslog, which it seems comes with the Andorran citizenship. I had QSOs with Santi and received his card. His brother Joaquin is EA3BQR.

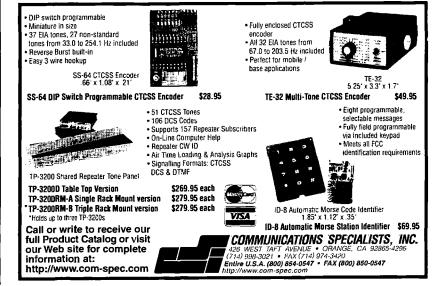
Luis C33LM (Photo Q), in Andorra la Vella, is an auto mechanic. He got his Novice license in 1996. With a TS-570D he is feeding 100 W into a Cushcraft R7000 vertical antenna. He has DX cluster, has worked over 60 DX entities, has QSL cards, and is logging with ... Swisslog.

In Aixirivall, high up on mountaintop at 3,200 feet above the sea level, is, the house of Carles, or Carlos in Castilian, C31SD (Photo R). His house may be way up but the surrounding mountains are ever higher. He retired from banking and was licensed in 1960. His antennas are a 6element yagi for 10-15-20 meters, and separate wire dipoles for 40 and 80 meters. He has an FT-980, an FT-901DM, and an FL-2100B 500 W amplifier. With a second Sommerkamp SL-7000 amplifier, he can push 700 W. Carlos works SSB, SSTV, RTTY, and CW with the keyboard.

I worked Carlos, sent a card to his manager CT1AMK, but did not receive anything back. I did not leave until he filled out a OSL for me. I did not go up the mountain for sightseeing!

Even higher up the mountain than the house of Carlos lives Fred C31HK,

Continued on page 40



Cold Fusion, Hot Speculation

OK, experimenters, get ready to do this on your kitchen table.

My considerable involvement as an electronics consultant to physicists and chemists investigating cold fusion naturally left me with my own interpretation of this elusive phenomenon. My opinion will be found a bit off the beaten path, but in any event it should provide food for thought.

The usefulness of an energy source for human needs decrees that it should be available, economic, convenient, and safe. These attributes are, of course, inter-related. Appraised from any viewpoint, the promise of abundant energy from a simple apparatus via "cold fusion" appeared almost too good to be true. This, alas, apparently turned out to be so! Nonetheless, a minority of creditable investigators feel more might have been involved than "smoke and mirrors" or bad science.

Yet, any researcher continuing to claim demonstration of this elusive phenomenon risks both reputation and paycheck. Professionals and the public are both fed up with repetitive reports of nonrepetitive performance. The whole bizarre scenario evokes questions and speculations. Are we to assume that all of the scientists and technologists purposely or inadvertently made fraudulent interpretations? Or, were they such inept experimentalists that they became victims of their own negligence? Attempts to provide a soul-satisfying answer seem only to deepen the dilemma. In any event, a basic setup for (allegedly) demonstrating cold fusion on your kitchen table is shown in Fig. 1.

An interesting speculation can be made without recourse to formidable mathematics or esoteric physics. (This, indeed, is the general prelude to more rigorous analysis.) Let's suppose that the reports of inordinately high energy generation were valid observations, but that the responsible reaction was not necessarily nuclear, but rather an enhanced chemical type hitherto unrecognized. A couple of examples in nature may hopefully lend credence to such an idea.

Consider that noble beast of burden. the horse. After imbibing a small portion of a bale of hay, he is able to transport his several-hundred-pound payload for a few hours over rough and even hilly terrain. A little "horse sense" disposes of the need for extensive thermodynamic calculations there is no way oxidation or combustion of the meager quantity of dried grass can fuel the work output by familiar chemistry. Surely, there resides a mystery of energy conversion in this beast's digestive metabolism, or in its muscular system. How, indeed, does he get so *much* bang for the buck?

In a similar vein, you think of the several-hundred-kilometer flights of migratory birds, sometimes buffeted by sustained headwinds. The energy conversion for this athletic feat apparently derives from a handful of bugs, seeds, or berries, but how? Here again, an accounting based upon the data and rules of physics and chemistry falls far short of satisfaction. A model airplane laden with sufficient fuel for such a flight would never take off. And, this would remain true even if its motor operated with an idealized Carnotcycle and had frictionless bearings, or if its propeller screwed through the air with 100% efficiency. It clearly behooves us to speculate about the possibility of greater energy extraction from matter than we have been accustomed to deal with, i.e., a conversion process somewhere between nuclear and "ordinary" chemical reactions.

Interestingly, the discipline of chemistry can be viewed as an arbitrary (but academically convenient) classification of *electronics*. This is because most chemical reactions result from displacements or exchanges of electrons in the outer orbits of atoms. Energy invested in these electrons thereby

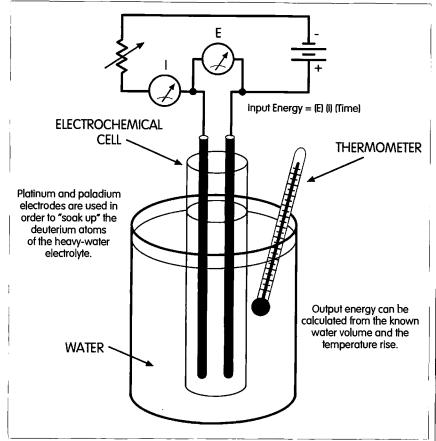


Fig. 1. Basic setup for demonstrating cold fusion, hopefully. Allegedly, the heat energy represented by the temperature rise in the surrounding water can exceed the energy input to the electrochemical cell. The elusive phenomenon is supposed to occur only when the electrolyte of the cell is heavy water (deuterium oxide, where deuterium is an isotope of "ordinary" hydrogen). It is claimed, moreover, that nuclear fusion reveals itself by liberation of neutrons from the cell. (Trace amounts of substance can be added to the cell to improve its electrical conductivity.)

becomes available to us. usually in the form of heat or electricity. Although these facts of life must be "old-hat" to most readers, certain ramifications derived therefrom should prove worthy of consideration in our search for higher energy yields.

The "universal technological device" can lend insight to our efforts; as shown in Fig. 2, it is a sandwich of three sections. Depending upon the conductivities and junction characteristics of these sections, a wide variety of practical devices can be realized. All stem from manipulation of the energy levels of electrons. Included are the capacitor, the electrochemical cell, the fuel cell, the thermoelectric cooler, the transistor, the solar cell, and, with mirrored inner-surfaces of the outer sections, even the laser.

The device most like the cold fusion apparatus is probably the electrochemical cell. This is interesting in the light of the vigorous development now underway to squeeze more energy-perpound from batteries for electric vehicles. Progress has been made by the use of exotic materials, but here, too, the solution could conceivably assume the form of an *enhanced* chemical action thus far guarded in secrecy by Mother Nature.

Allusions to "enhanced chemistry" need not suggest far-out science fiction; we are *already* acquainted with phenomena akin to ordinary chemical reactions, but with inordinately unique yields. A good example is that of photosynthesis. In this everyday process, plants convert carbon dioxide and light energy into the carbohydrates which

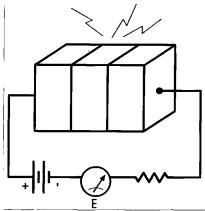


Fig. 2. The universal technological device. The electronic behavior of this system is governed by appropriate selection of conductivity and surface characteristics of the three sections. You can thereby produce a capacitor, an electrochemical cell, a fuel cell, an electroplater, a transistor, a solar cell, a thermoelectric cooler, and interestingly, a cold fusion apparatus. The operating principle of the latter device remains a tantalizing mystery.

feed and fuel their metabolism. Texts freely concede we have not yet attained a firm grasp of the complex chain of reactions underlying this remarkable conversion.

Another process qualifying as "enhanced chemistry" is the environmentally destructive depletion of millions of ozone atoms by a single chlorine atom. Such a transformation is in a league by itself compared to more ordinary chemical reactions, where the exchange of atoms occurs on a tit-fortat basis.

Finally, consider the principle of the laser. Here, too, a unique output comes about via appropriate manipulation of the *energy levels* of electrons surrounding the atomic nucleus — certainly suggestive in part to behavior in garden-variety chemistry.

The diversity of results from such differing changes in the energy levels of orbiting electrons should induce open-mindedness with regard to the tantalizingly erratic phenomenon of "cold fusion." (We can let the academics argue the appropriateness of the terminology — nuclear fusion may *not* be involved.)

Continued on page 41

For the Above and Beyond Crowd

Here's a neat RF modulator/detector for use with surplus microwave SWR meters.

Microwave test equipment has never been plentiful or inexpensive. This fact becomes readily apparent as soon as you want to make a measurement of power, gain, frequency, and so forth. Here's something you can build for yourself.

he earliest microwave experimenters found value in modulating their sources with a 1 kHz tone and using a simple crystal detector followed by a tuned audio amplifier and voltmeter as a measurement tool. The technique was quickly adapted for use with slotted lines for making impedance and SWR measurements.

Even today, the technique is used for amateur radio VHF/UHF/Microwave antenna gain measurement contests. A tone-modulated oscillator or signal generator with a broad beamwidth antenna

is used as a source, and a crystal or video detector followed by an HP 415 or similar SWR meter is used to make power measurements relative to an antenna with known gain.

This idea works well if your source can be easily amplitude-modulated (AM). However, most microwave brick oscillators, klystrons, and Gunn diodes do not lend themselves to direct AM modulation. Most can easily be frequency modulated (FM), but AM must be done with an external modulator such as a PIN-diode. The only PIN-

diode switches I own exhibit a large reflected impedance difference between their on and off states which can upset the stability of some sources.

I wanted to be able to test with a variety of microwave sources without having to build a unique dedicated modulator for each source, so I decided to modulate the receiver instead of the transmitter. This idea is not that much different than what is done with a Dicke radiometer or even the earliest automotive radar detectors. The idea is to chop the input line to the detector. With no RF present, there is no output. When RF is present, the output is an AC signal at the chopping frequency, proportional to the amplitude of the incoming RF. The only difference between the two approaches is that with this system, the meter will respond to all RF present, whereas with the modulated source, the meter only responds to the modulated RF. While a simple RF bandpass filter should cure any interference problems if they occur, I have yet to need one.

Years past, at a hamfest, I had purchased several Hewlett-Packard (HP) PIN-diode SPDT switch modules as an investment that now seemed ideal for the task. All I would have to do would

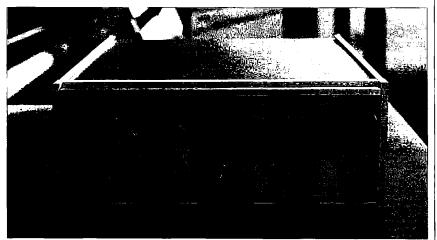


Photo A. Front view of modulator/detector.
30 73 Amateur Radio Today • August 2000

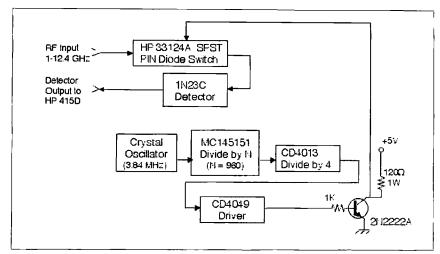


Fig. 1. Block diagram of HP 415D modulator/detector.

be to feed the received RF to one of the switches, turn the switch on and off at a 1 kHz rate, and follow the switch with a broadband RF detector. The result would be a universal adapter to allow me to use my HP 415D SWR meter with any source within the frequency range of the PIN-diode switch and detector. The PIN-diode switch I used, a Hewlett-Packard model 33124A, has a bandwidth of 0.1 to 12.4 GHz, and the detector I used, a Sage 1021H, has a bandwidth of 1 to 12.4 GHz. The net result is a system bandwidth of 1 to 12.4 GHz.

A block diagram of the system is shown in **Fig. 1**. A complete schematic diagram of the PIN-diode switch

driver is presented as **Fig. 2.** I have several HP PIN-diode switches, but the 33124A was the only one I could use in a negative ground system.

I could have used a simple, free-running, NE555 1 kHz oscillator to drive the PIN-diode switch, but decided instead to use a crystal-controlled driver for several reasons. First, the cost of a crystal oscillator and divider chain is not that much more than a free-running oscillator. Second, a very stable source would be needed to take full advantage of the fact that the HP 415 bandwidth can be narrowed down from 100 to 15 Hertz. And, third, I like the idea of no

Continued on page 32

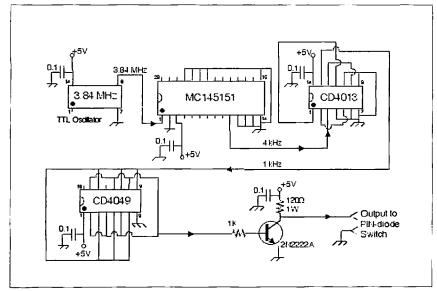


Fig. 2. Schematic of 1 kHz generator and driver circuit.

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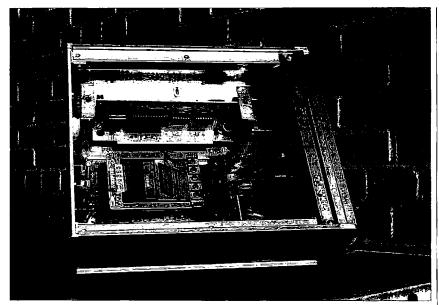


Photo B. Modulator/detector with cabinet cover and driver shield removed.

For the Above and Beyond Crowd

continued from page 31

adjustments or calibration required — too many knobs spoil the measurement.

Having decided to start with a crystal oscillator, why didn't I use a common 1 MHz TTL oscillator? Well, a quick check of my junk box revealed several TTL unit oscillators. I hated to use one of my 1.000 MHz units when I had some other units with seemingly odd-ball frequencies. I selected a 3.84 MHz unit

because it will probably otherwise never be used. Use whatever oscillator you have, as long as the output frequency is an even integer multiple of 1 kHz.

Following the oscillator. I used an MC145151 integrated circuit to divide the 3.84 MHz by 960 to get 4 kHz. The MC145151 was designed to be part of a phase locked loop and has many internal functions which are not needed for this application. However, the divide-by-N portion can be used independently of the other functions. The

Photo C. Modulator/detector with cabinet cover removed. PIN-diode driver at top, power supply in the middle, and PIN-diode switch with detector in lower right.

MC145151, when operated from a 5 volt supply, has an upper frequency limit of 15 MHz and is hardwire-programmable to divide by any integer from 3 to 16.383. To divide by 960, the N = 9, 8, 7 and 6 pins (512 + 256 + 128 + 64 = 960) are left floating (internal pullups) and all other divisor pins are grounded. Use whatever divisor will divide your particular oscillator down to 4 kHz.

Why did I go for 4 kHz instead of 1 kHz? Well, I wanted to drive the PINdiode switch with a 50% duty ratio square wave. The output pulses from the MC145151 are not a 50% duty ratio square wave, but have a pulse duration equal to the period of one cycle of the input signal, 0.26 microseconds in this case. Therefore, I knew I would need to add at least one binary flipflop following the MC145151 to achieve the 50% duty ratio. Since most integrated circuit flip-flops have at least two stages per package, the output of the MC145151 could be either 2 or 4 kHz. I chose 4 kHz. The divider I selected to follow the MC145151 is a CD4013, a common two-stage type D flip-flop. A type D flip-flop will toggle or divide by two if the set and reset pins are grounded and the not-Q (complementary) output is connected to the D input. The flip-flop input is the C or clock pin, and output is taken from the Q pin. As I mentioned, I used both stages to divide by four and achieve a 50% duty ratio 1 kHz square wave output.

Of course, the CD4013 CMOS integrated circuit does not have the capacity to directly drive the PIN-diode switch. I paralleled the six inverters in a CD4049 to act as a drive amplifier followed with a simple 2N2222A switching transistor. Of course, all six inverters are not needed, but the inputs to the unused inverters would have had to have been tied to ground or the supply anyway. so why not just parallel them and not worry.

The PIN-diode switch is supplied current through a 120 ohm resistor from the 5 volt supply line. I initially tried a lower value resistor to get a higher PIN-diode current, but the increase in signal output was marginal,

and the power consumption and radiated noise level were much higher. The difference in detected output between using a switch that switches from 0 to 10 dB versus one that switches from 0 to 100 dB is less than 10%.

The 2N2222A transistor, when switched off, has no influence on the PIN-diode current. When switched on. the 2N2222A shunts all the current through the 120 ohm resistor to ground, thereby reducing the PIN-diode current to zero. The PIN-diode switch is on when the transistor is on and vice versa. By using a shunt switching configuration, the current through the 120 ohm resistor is relatively constant. This way, no large switching currents are generated that can radiate and be picked up by the HP 415D SWR meter. After all, the HP 415D has a useful sensitivity approaching 0.1 microvolt, and the final system noise floor will determine the ultimate sensitivity of the complete instrument.

The voltage across the PIN-diode switch is 0.1 V when the transistor is on and 0.9 V when the transistor is off and all of the current is passing through the PIN-diode. The 120 ohm current limiting resistor is dissipating 0.2 W when the transistor is on and 0.14 W when the transistor is off. The average power dissipated by the resistor is 0.17 W. For reliability, I used a resistor with a 1 W rating. The current drain on the 5 V regulated power supply, not including the LED power indicator, is approximately 60 mA. The LED power indicator draws an additional 12 mA.

To further reduce radiated noise, the driver circuit board is mounted inside a shielded enclosure and the TTL oscillator module and each integrated circuit is bypassed with a 0.1 µF capacitor. The circuit board, mounted in its shielded enclosure, is shown in the photographs both with the shield removed and in place.

The shielded driver is mounted in a larger aluminum cabinet along with the regulated 5 volt power supply, PIN-diode switch, and crystal detector. The cabinet volume is less than the HP 415D and is easily stacked under or

over the HP 415D as seen in the photographs. Coax cables are used internal to the cabinet between the front panel feedthrough connectors and the PINdiode switch input and the detector output. A short SMA jumper cable connects the PIN-diode switch and the detector as seen in the photographs. An SMA to SMC cable is used to route the 1 kHz drive to the PIN-diode switch. I mounted the PIN-diode switch and the detector on a common bracket for ease of assembly and to minimize the length of the interconnect cable. The usual paint trim, handles, and label decals were applied to the front panel.

In operation, the HP 415D "INPUT SELECTOR" switch is set to "XTAL." either 200 ohm or 200k depending on which position gives the strongest reading with your detector. I usually use the 200k position. Do not use the "BOLO" or bolometer position, as it is designed to supply a current bias to the detector and can destroy the crystal diode. If you use a Hewlett-Packard detector with its own, matched, square-law optimized load resistor, use the 200k setting.

Because a diode detector, when used with low level signals, is a square-law device, the dB scales are reasonably accurate relative power indicators. For example, a change in meter reading, up or down, of 3 dB, represents a factor of two power change. The unit can be used for antenna gain measurements, relative to a known antenna, attenuation measurements, and small signal amplifier gain measurements, as well as slotted line impedance measurements as explained in the HP 415D manual. While the unit was designed and built with the HP 415D in mind, it should work equally well with other 1 kHz tuned SWR meters having a crystal detector input.

How well does it work? I continue to be pleased with the performance and use it regularly. Using a mid-value gain setting on the HP 415D, the noise floor is mid-scale on the 50 switch position. At 1 GHz, a signal of -42 dBm is 3 dB (full scale deflection) above the noise floor. At 2 GHz, a signal of -47 dBm is also 3 dB above the noise floor. The only regret I have is that I did not build it sooner.

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A Good Look at WinAPRS

Mark Sproul's shareware program brings a new dimension to cutting-edge fun.

In 1992, Bob Bruninga WB4APR came up with a new approach using packet radio technology. This new mode, which he titled Automatic Position Reporting System (APRS), included the position of the transmitting station as an integral part of the message, which allowed for the tracking of objects using a computer program Bob had written. What makes this so useful is that the location is not merely reported, but instead is accurately displayed on a map. At a time when the first wave of interest in packet radio had faded, APRS appeared with just the right features to take over.

Coincidentally, the early '90s also marked the explosion of personal computers. This ground swell was due in a large part to the development of Graphical User Interfaces (also known as GUIs). The

Apple computer had introduced their GUI, and because of the Apple's popularity, a short while later Microsoft offered the Windows operating system for IBM-compatible personal computers.

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and 6:		F GPS on VHF
md 7:		Fice VHF
md 8:		Pico HF
md 9:	PL (FI) Switch
md 10:	PZW	IF) Switch

Fig. 1. Click on "Settings", then "TNC". Using this screen, you can choose the commands which make your computer and TNC communicate. My TNC is an MFJ-1278, so I merely click on the MFJ button to establish the commands.

Bob Bruninga's APRS program was written in DOS, but when brothers Mark and Keith Sproul heard Bob introduce APRS, they realized that it would be ideal to run it in a GUI environment. Keith wrote an APRS program for the Apple Macintosh and named it MacAPRS. Even though Mark had never written anything for Windows before, he succeeded in porting the program from the Macintosh operating system to Windows.

There are some differences between the MacAPRS and WinAPRS versions of the program, but they are relatively insignificant. But as we all know, it is important to have just a few differences if for no other reason than to keep the discussions between Mac fans and PC fans lively. If you think you might be interested in APRS. I recommend WinAPRS or MacAPRS as the way to enter this new and exciting aspect of ham radio. I'll focus on WinAPRS for this review, but most comments will be true about either version.

Equipment needs

The equipment list for the most common type of operation is relatively short

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Longitude:	80	40	9	CECW	08040.1	5W	
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Fig. 2. By clicking on "Settings", then "Station", you'll see this screen. Here is where you enter the information about your station, including location. This is also the screen where you can select the icon which will be displayed on everyone else's computer screen.

— a 2 meter transceiver, power supply. antenna, terminal node controller (TNC), and connecting cables. If you have the components of your old packet station. you're in business. WinAPRS supports all standard packet radio TNCs, so the either Windows 95 or Windows 98.

radio piece of the equipment puzzle should present no major problems. Obviously, you will also need a computer. WinAPRS runs under Windows, of course, and most users will be using

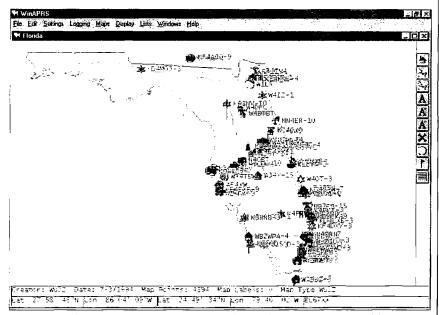


Fig. 3. Notice how APRS activity is so widespread throughout the state. Many of the open areas are areas such as the Everglades which are not populated. While the screen appears busy, WinAPRS will allow you to separate stations by zooming in on a particular area or choosing which types of stations you wish to display.

If, on the other hand, you are running Windows 3.1, you will need to download and run another program called Win32S before you run your WinAPRS program. If you attempt to run WinAPRS without Win32S, the program will immediately terminate when you try to run it. As an aside, if you are running Windows 3.1 because of memory constraints and you are not using that computer for any other purposes, you may find it beneficial to at least think about running the DOS version of APRS.

How to get WinAPRS

WinAPRS is as close as your connection to the World Wide Web. You can download the latest version of WinAPRS (Version 2.4.5) from one of several sites. The Tucson Amateur Packet Radio Web site [http:// www.tapr.org] offers a link the various versions of the programs for most currently available operating systems, as well as a forum for APRS users, etc. From the home page, go to the APRS and GPS section, and from there choose WinAPRS. You will see a list of all the available files for various versions of WinAPRS. You can also go directly to one of the two download sites:

[ftp://aprs.rutgers.edu/pub/ hamradio/APRS/WinAPRS/]

[ftp://ftp.tapr.org/aprssig/winstuff/ WinAPRS/1

First time APRS users will need to download the entire program, so look for the latest version and date. As of this writing, version 2.4.5 is the latest. To download the entire program, look for waprs245.zip. Once you have a version of the program running, you will be able to download updates that will add newer features or fix problems. Updates will have a title such as w245updt.zip. In any case, just choose the program that interests you, and double click on it. In a few minutes (or more, depending upon your modem speed), you'll have the program on your hard disk. The ".zip" indicates that these programs are stored in a compressed format that allows for easier storage and faster transfers.

In order to decompress the program 73 Amateur Radio Today • August 2000 35

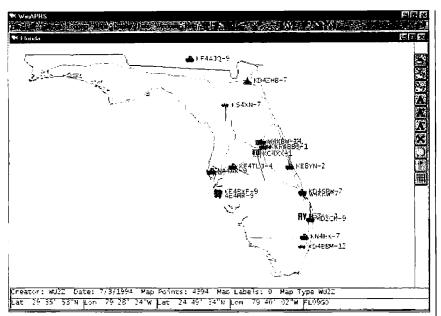


Fig. 4. Here I've selected to display only tracked stations — that is, stations which have been in motion. It is just as easy to select only stations you have heard direct, only weather stations, or only stations that you have "flagged."

file, you will need a copy of PKUNZIP, WinZip, or a similar program to convert the compressed file you downloaded to a workable program. If you use PKUNZIP, you will need to type Pkunzip -d waprs245.zip. The "-d" tells the program that there are directories (also known as folders) which it needs to create. If you have WinZip on your computer, it should start running automatically as soon as the download is complete, and should create the folders without any action on your part.

When the program decompresses the .zip file, you will have the main folder with certain subfolders. The recommended folders include DATA, DOCS, MAPS, LABELS, LOGS, OVERLAYS, and SOUNDS. You shouldn't have to do anything to create these. The decompression program creates all of these folders and the installs certain required programs without any effort on your part. Once expanded, the program is ready to run.

Starting WinAPRS

The first time you run WinAPRS, you'll have to enter certain information that I'll describe in a minute. Before I do that, though, I need to point out that this program is shareware.

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That means that you can run the program with all its features and benefits as soon as you install it. However, a lot of time and effort went into this program, so it seems only appropriate that you register your program with the author. This is the right thing to do. In addition, with an unregistered copy you will need to re-enter a lot of information every time you start the program. With a registered copy, the program saves the information and you will not need to enter it unless there is a change in the information. If you live in an area subject to brownouts, etc., you'll find this to be an important feature.

The program opens with a map of the continental United States contained within a standard Windows configuration. There is a menu bar at the top so that when you choose one of the items, a window of additional choices scrolls down. Most choices are point and click, although some information will need to be typed in. Start with the Settings menu, and you can begin to enter information in the order in which it appears on the menu.

The first choice on the Settings menu is "Master Mode", which tells the program how you want it to run. In most cases, you will select "Normal Ham Operations". This allows you to

display all types of stations. It is also possible to choose a "Weather ONLY" mode which can be useful during times of severe weather if you are active in SKYWARN or a National Weather Service station. This will display only weather stations.

Next, you can choose the "Station" selection. In this window, you will enter your station call, station type, transmitter power, antenna height, etc. Here you can select an icon which will be displayed on all APRS displays. Since my fixed station is in a house with a vertical antenna. I chose an icon that looks like a house with a vertical antenna. For my mobile station I chose — never mind (okay, a car). You also will need to indicate your location in latitude and longitude coordinates. There are several ways to determine this. A detailed map, such as a sectional chart used for flying, will give you these coordinates.

You can also use an online service such as [http://www.qrz.com]. Look up your own callsign, and when you request more information, it will indicate your latitude, longitude, and grid square. Of course, you can also locate your position on the map displayed on the screen. The program will indicate the information for the current cursor position on the map. In any case, you will need to enter your location, or else your station will not appear on any other ham's map since the program won't know where to draw it. You can also enter a string of data as your status. This will be periodically transmitted and can be any comment you like. Some folks include alternate contact information such as a local repeater frequency or an E-mail address.

The next key items to enter into the system are those which will allow your system to work. A serial cable of some type connects your TNC and computer. The WinAPRS program needs to know which serial port the computer is using to communicate with the TNC. Next, you need to tell the program which type of TNC you are using. The most common types are indicated, and by selecting yours the system knows which commands the program must send to start the TNC's various functions. If

your TNC needs some additional codes entered, you can enter these at this time and they will become part of the start-up sequence. Most of the time this is not necessary, but it's good to file this information away for future

You can run APRS on both HF and VHF, but many people operate on 2 meters only. Part of the configuration of the TNC is to identify it as a single port or a dual-port TNC. A dual port can control both HF and VHF radios from the same computer. Select the correct configuration for your TNC and your preferred band.

Incidentally, there may be some confusion about frequencies, so now is as good a time as any to address the frequency issue. Most VHF APRS in the United States is now on 144.390 MHz simplex. Older references mention at least one other frequency that caused interference with satellite operations. Ignore the old frequency and stay with 144.390. In addition, as more APRS stations appear in most areas, remember to keep the power down. If you wish to operate HF APRS, the conventional frequency is 10.151.51 lower sideband (LSB). This may appear to be

outside the ham bands, but since the carrier is 2125 kHz down, it actually is within the band.

Most of the other settings are fairly straightforward. If you need additional information, you can access or print out a very thorough set of documentation at: [http://aprs.rutgers.edu/WAPRSdoc. htm]. This may prove very useful as you get to know the basics about this program and want to work with more advanced features. One, the KISS mode, hands a lot of the tasks traditionally managed by the TNC to the computer. Although the computer stays busy, there are many more capabilities available under this mode.

Once you have everything configured, you should see your TNC indicate that it is in contact with the computer. On my MFJ, this means that all but one LED stop glowing. Make sure that if you can adjust the sensitivity of the TNC, that it is properly set. On my system, it is just below the half-way point. The decode (DCD) LED should illuminate every time it detects and decodes a packet. As the start-up sequence completes, the computer sends a query looking for other APRS stations, and you should see the push-

to-talk (PTT) light on your TNC or the transmit indicator on your radio. This is a pretty good sign that everything is working. Next, you'll begin to see nearby stations appear on your map as they respond to your query. As time goes on, you'll see stations from hundreds of miles away appear.

Much of this program operates in a very intuitive fashion. If you have used Windows before (and who hasn't?), you'll have few surprises. Check each of the menu choices at the top of the window. I usually switch from the continental United States map to my state map for greater clarity. As you get familiar with WinAPRS, you'll realize that you can display on multiple maps, and there are many types of maps available. You can use some atlas programs, and it is even possible to display stations on satellite images rather than line drawn maps. Many of these maps are available on line, although the most detailed are commercially produced on CD-ROM. It is very easy with a commercial atlas to identify a station by street!

Besides the map window, you can display various lists. The station list shows all stations that you've received. By clicking on the column heading, you can sort by station call, by date, etc., so that you can locate a particular station. From there, you can have the program identify the station's location on the map. The program draws a shrinking halo around the station so that you can easily locate it. You can also send a message to the station.

You can display a list of messages and display all, or just bulletins, or even limit it to those messages either addressed to you or sent by you. An interesting feature of this program is the ability to set it up to automatically reply to a message. In this way, the sender knows your station received it and you can scroll through your messages next time you sit down at the computer. My system runs all the time (except when my local electrical company fails), so I frequently have message traffic waiting for me. To

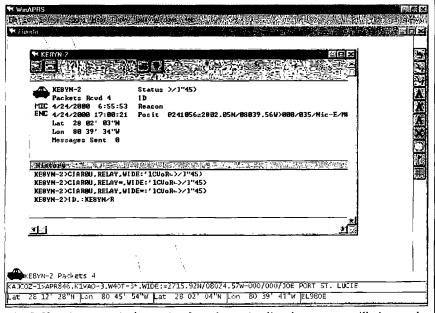


Fig. 5. If I select a particular station from the station list, the program will give me details about that station. If I click on the map button, it will highlight that station on the map. The envelope takes me directly to the message window so that I can send a message to the station. The automobile button displays the track information while the balloon provides altitude information as well.

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A QRO Rig in a QRP Car

IC-706, meet Chevy Metro.

My first exposure to HF mobile operation came right after I got my ticket in 1975. One of the locals had a Heathkit HW-101 mounted in the family Buick. Now, you have to remember, in those days, the American-made family auto was huge. Even with the HW-101, there was plenty of room for three adults in the front seat.

he rig was mounted on the floor, and the DC-to-DC converter was mounted under the hood. You had to keep the engine running to supply enough power to operate the rig!

The antenna system was a mismatched home-brew whip using the



Photo A. This is the first version of the mobile antenna installation. Notice how short the loading coil is compared to the car's body.

classic bumper antenna mount. Remember real steel bumpers? Those chrome and steel mammoths that you could easily mount a full wave 40-meter vertical to? It was an impressive sight for a new Novice.

That was then, this is now

I've always liked small cars. In fact, I've never owned a Buick. For me, the smaller, the better. Must be the ham in me, as I enjoyed the high gas mileage the little cars provided. I've always had some sort of VHF rig in all my automobiles, but never gave much thought to HF. To put an HW-101 in my Ford Fiesta would have required setting it on the passenger seat! But things have really changed with the introduction of the new micro-sized HF rigs by Kenwood and Icom.

New automobile, new rig

When the Fiesta died, I purchased a new Chevy Metro! These were known as the Chevy "Geo" when General Motors was into the "Geo" nameplate. The allure of three cylinders and 50+ miles per gallon impressed me to no end. Along with the new car, I decided

to purchase an Icom 706. Installing the Icom in such a small car would prove an exercise in engineering.

I quickly decided that the Icom would not fit under the dash on the Metro. One of the great features that the Icom 706 has is the ability to separate the control head from the rest of the rig. The two sections talk to each other by use of a control cable.

Usually, I keep my cars until the wheels go square. But I did not want to tear into the dash of the Metro either. The best place to mount the control head was on the ash tray. To get the proper alignment, so I could see the display while behind the wheel, a small piece of wood was installed. This wooded strip is bolted to the ash tray door, and the control head mounting bracket is mounted to the wood strip.

Mounting the 706

The ash tray door is easily removed from the car. In case I decide to sell the car, a replacement ash tray door could easily be obtained from a junkyard. The business end of the Icom is located under the passenger seat. A piece of 3/8" plywood cut to fit under the seat holds the rig by using the mobile

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mounting hardware. The plywood is kept from sliding around by placing Velcro on the plywood. I used the "hook" half of the Velcro. This stuff sticks to the carpet and prevents the plywood from moving around. It's easy enough to pull the plywood up and out from under the seat if I need to access the rig.

Getting power to the Icom

At full power, the Icom requires over 20 amps at 12 volts. A direct connection to the battery is a must. The power cable is routed through the firewall of the Metro. I was lucky enough to get the cable through the firewall via a rubber grommet. I don't know what the grommet was used for, but it worked super for me. The power cable was then routed under the plastic trim and carpet to the rig under the seat.

The power cable that comes with the Icom is long enough to reach from the battery to the rig under the front seat. Icom has installed two inline fuse holders. But the Icom fuses are mounted close to the rig. The wires from the battery to the rig needed fuses, too. So I installed one more inline fuse holder right next to the battery.

Antenna system

A mobile antenna is always going to be a compromise antenna. This is especially true when dealing with 80 and 40 meters. The hardest part, I found, in assembling a mobile setup was trying to mount the antenna on one of today's cars. Gone are those steel bumpers. Today, they're made out of fiberglass and covered with plastic. So, forget about using one of the old bumper mounts.

The antenna I had chosen was a multiband unit from Texas Antennas. It looks like one of the classic bug catchers, but is a bit smaller. Nevertheless, it's a monster of an antenna when placed next to a car like I drive. Mounting this antenna would prove interesting.

Mobile antenna mounting

I looked at the problem of getting such a large antenna mounted to such a small car. This was not going to be easy. The usual method of mounting would not work; the antenna was way too heavy. Bumper mounting it was out of the question, too. Of course, getting the antenna placed on the car was one thing, but keeping it on the car at 65 mph was an entirely different problem!

I already had two Comet trunk/hatch mounts placed on each corner of the hatch. These were for the two-meter and 440 MHz antennas. The mounts would hold the HF antenna just fine, but not while mobile. Crawling under the car, I found two tapped holes in the underchassis. I have no idea what they are for, but they looked like a good place to attach a metal support. Lucky for me, I work in a steel mill. A quick trip to the weld shop produced a hunk of flat steel stock about four inches wide and several feet long. The stock is 3/8" thick.

A piece of cardboard was used to get all the angles and bends ironed out before torch touched metal. A few minutes with the torch, and the flat stock was formed into the desired shape. Two holes sized to fit the ones in the car's frame were drilled in the metal. On the other end of the flange, a large hole had to be drilled to allow the ball mount to fit. The ball mount is held to the metal flange with four stainless steel bolts. I fastened the coax to the mount and then applied a large glob of coax sealer. This bottom piece would be exposed to all kinds of weather, and had to be sealed. The entire shebang was then bolted into place with two metric bolts. With the antenna screwed into place, it was a sight to behold! Now, would it work?

Getting a mobile antenna resonant

In a nutshell, my super mobile antenna was not even close to being resonant anyplace near the ham bands. Good thing that Jim WA8GXM has one of the MFJ antenna analyzers. That tool really came in handy when working on the mobile antenna. Nothing I seemed to do would bring the antenna even close to being resonant. I even tried using an external antenna tuner between the antenna and the radio. All that did was arc the tuner. After much discussion with Jim, we came to the conclusion that

the antenna was too low. Lucky for me, I had purchased the extension section. Adding that to the antenna helped quite a bit. Now we could at least get the antenna resonant, and, by using the tuner, could move from CW to phone without stopping the car and changing tap locations on the coil.

On the downside, with the added height, the antenna became too unstable. Even the thick metal bracket holding the antenna would flex. The solution was an old one. I added some guy strings to hold the antenna in place while tooling down the road. Most of the time, you would use nylon fishing line. This guy was way too heavy for that stuff. In my case I use 1/4-inch nylon clothesline. Two pieces were used. They were tied off to the Comet hatch mounts. The guys would permit highway speeds without tearing the antenna off of the mount. The downside was a reduction in gas mileage. It's an extra effort for those three cylinders to move that much antenna down the road. With the big antenna on and a six-meter whip and two-meter 5/8 wave on the other mounts, I stopped traffic! As a matter of fact, when I was stopped in traffic on Interstate 4 in Florida, some guy yelled out, "Hey

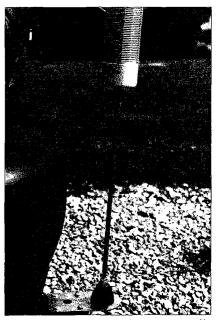


Photo B. This short shaft was eventually replaced to increase the height of the loading coil. Notice the metal mounting bracket from under the car's body.

buddy! Can you get ESPN with that setup?"

How does it work?

Well after all the work Jim and I put into finding the resonant points of the antenna. I can say that the entire system works. Not great, but it does work. With those guylines, it's almost impossible to open the hatch. Stopping and changing taps to change bands is not my idea of fun either.

In order to operate without changing bands all the time, I would start out using the lowest band that would be open. I'd start out on 40 meters, hit up MIDCARS and then drive until 20 meters opened. I'd change taps and continue this scheme so that by the end of the day I was working 10 meter phone.

Problems

For a car with only three cylinders, they sure make a lot of electrical noise. As soon as you start moving, the noise level goes up to S-7. Any signal less than that, and I can't hear.

The Metro has your basic 2-55 air conditioning. You know, two windows down going 55 miles an hour. Trying to talk with that much wind noise proved interesting.

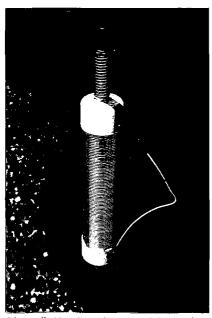


Photo C. Here's a close-up of the loading coil.

With this monster antenna, it took an hour or two to get everything hooked up and bolted down. The system I used was not something I could throw on the car in a minute's notice. Something else was needed for quick HF setup.

For those quick mobile QSOs while heading to a far-off hamfest, I put on one of the helical-wound whips. I have one for just about all the bands I operate on. I usually use 40, 10, and 75 for SSB. For CW, there's 30 and 40 meters.

The whips are easy to set up and usually give good performance. They are not as good as that huge Texas antenna, but setup only takes a few minutes.

I did find one problem with the whips. For some reason, I could not get the antennas (any band) to resonate. The trouble was tracked down to the hatchback mounts. They really don't supply a good RF ground for the antenna.

Designed not to dig into the paint. the mount did not work as it should. I had a good DC ground provided by the shield in the coax from the radio to the antenna mount, but not a good RF ground. The solution was simple. I took a hunk of RG-8U, stripped off the shield (threw away the inside wire) and soldered a large ring to each end of the shield. One of the bolts holding the hatch in place was removed; the ring went over the bolt. The bolt was then screwed back into the car's frame. The other end of the shield went to the ground side of the Comet mount. When the shield was connected, there was a day and night difference in the way the whip antennas worked.

So, there you have it. A QRO rig in a QRP car. It took several tries, but overall, HF mobile is fun! It's slick being able to take HF ham radio with you as you travel down the interstates. Next stop: ESPN.

10m Junk Box Amp continued from page 18

Canada, and as far west as Nebraska, using a simple halfwave dipole antenna. It has also served the purpose for which it was designed: To be able to communicate with KC4DQR, my son, Mike.

In this day of amateur radio equipment being mostly plug-in appliances, I found a great sense of joy and pride in being able to make those Field Day contacts on a rig that I, at least in part, designed and built. After all, isn't that what amateur radio is all about?

Vaya Con (Ra) Dios continued from page 27

ex-C31LHK. He is at 4,400 feet above the sea level. In the early 1950s, Fred was PK1AF in Java and PK4AF in Sumatra. He used to have a yagi and is planning to reinstall it again, but for now he has a vertical antenna for 10-15-20 meters. Fred has an FT-1000D and a TS-830S. For a mobile rig, he is using an IC-725.

In the evening, I was the guest of the Radio Amateur Union of Andorra, and was taken to a fancy restaurant where they served "nouveau cuisine." The meals were indeed beautifully and ceremoniously served, but the portions were kind of small. We were four at the table; first the waiters brought two plates covered with some hemispheric metal lids. Then they brought another two with similarly covered plates. Then the four waiters lifted simultaneously the four covers and I think we were supposed to say: "Aaaaah!" But I was too hungry for any acting. The meals were good indeed, but as I said, on big plates they served tiny masterpieces. When you go to a fancy restaurant, it is better to have something to eat before leaving the house.

The hotel where I spent the night was very nice, and a complimentary breakfast was included in the price. It was the only meal during my 22-day trip that did not leave me hungry.

Between the visits. I had a chance to stroll around the streets of Andorra la Vella. window-shopping. I had heard that the prices in Andorra were lower than in Spain, but I found that Kodak film was more expensive. Cigarettes and gasoline are indeed cheaper in Andorra, and there is a lot of smuggling going on with these commodities.

No passports or luggage was checked at the border, neither coming, nor going.

I started to miss my home; every day I was thinking of my dog Bella, and every second day of my wife Eva. However, it was a trip worth taking thanks to Michel C31MO and the hams of Andorra, who let me in their shacks

Cold Fusion, Hot Speculation continued from page 29

Think of some of the surprising breakthroughs within quite recent times. You recall electrically conductive plastics, high temperature superconductivity, solid state batteries, ultra-capacitors, laser-induced chemistry, and so forth. It is only natural to anticipate more light to be cast on the phenomenon of "cold fusion." You suspect it is only a question whether such new revelations spring forth from megabuck research laboratories, or from the kitchen table of an experimentally inclined hobbyist!

A Good Look at WinAPRS continued from page 37

expedite this, I have my computer set up so that WinAPRS is loaded when the computer is started. As a station in automatic operation, this is fairly typical, although remember that this only works with a registered copy.

It's kind of hard writing about a product that has so many features. WinAPRS is a program that you should be able to run with no problem, on the first day you use it, and you'll keep finding new features to keep you interested. APRS is really growing, and this program is growing with it. Everything from hot air balloons to the International Space Station is impacting APRS, and this program is the easiest way to get started in this fascinating area of ham radio.

As I mentioned earlier, the program is available free on the Internet, but a registered copy makes life significantly easier and is well worth the investment. Try out the shareware version for a couple of weeks. If you agree with me, you'll find that the

sixty dollars to register WinAPRS is money well spent. The registration fee covers everything and even includes undates. I've never found a deal like this with any other software. Registration instructions are included in the program and documentation.

In any case, I think you'll enjoy APRS, and WinAPRS makes it easy to get started. I've had a ball with this, and run APRS at home and in my car. It's fascinating, cutting edge, and a heck of a lot of fun!

Letters

continued from page 8

the data I provided, it seems I could not. I had made two errors.

First, they said that I had an invalid name. My last name has two capital letters separated by an apostrophe. Second, they told me that my telephone number was also in error.

Aren't computers wonderful? My Commodore C-64 that I'm using now can spell my name properly, but the BILLIONS of dollars spent on computers in use by our governments and in some businesses today don't seem able to spell all our names correctly!

The press and TV really made a great big thing about the Y2K problem, concerning difficulties at the end of the 20th century. Yet, for many of us, there is no discussion or relief from a Y1.9K similar event. It was

during Y1.9K that computers decided that punctuation and capitalization were not necessary to "keep track of us." So, gradually millions of proud family names have been changed to something our Billion Dollar Computers have been taught to understand. I wonder how many generations will pass before "computers" and the people who manage them will eliminate our names completely, and instead know us ONLY by our 'number.''

> 73 Ad Sales Call Evelyn Garrison 1-425-557-9611

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CALENDAR EVENTS

Listings are free of charge as space permits. Please send us your Calendar Event two months in advance of the issue you want it to appear in. For example, if you want it to appear in the November issue, we should receive it by August 31. Provide a clear, concise summary of the essential details about your Calendar Event.

AUGUST 5

ALFARATA, PA The Juniata Valley ARC, and the Decatur Township Fire Co. will host a Hamfest 8 a.m. till ?, in Alfarata PA, 8 miles east of Lewistown, on U.S. 522 North, at the Decatur Township Fire Co. grounds. \$2 donation. XYL and kids free. Tailgating, \$5 donation. Food will be available. Talk-in on 146.91 MHz. For more info, call *Richard Yingling at (717) 242-1882*.

ITHACA, NY The Tompkins County ARC will hold the Finger Lakes HAM-IN (hamfest and fly-in) at Tompkins County Airport (KITH), 3 miles NE of Ithaca. Large hangar for indoor vendors and displays. Drive-in setup. Paved outdoor flea market and parking. Airplane rides and aviation displays. Pancake breakfast and BBQ lunch served by Boy Scout Troop 80. Admission \$5, under 18 free. Indoor tables \$10. Outdoor space \$2 each. VE exams, walkins welcome. Talk-in on 146.97. Contact Richard Spingam (607) 387-5251.

AUGUST 6

CROOKED LAKE, ANGOLA, IN The Annual Land of Lakes ARC Hamfest will take place at Steuben County 4-H Fairgrounds, corner of 200 W and 200 N, Exlt 150 off of I-69. Talk-in on 147.180 and 444.350. Packet 145.510. Tickets \$3 in advance, \$4 at the gate. Indoor tables \$8; trunk sales \$2. Vendor setup Sat. August 5th. 3–10 p.m.. Sun.. August 6th, 4–7 a.m. Free parking. Camping, swimming, amusement park and outlet shopping malls nearby. Contact Bill Brown. 905 W. Parkway Dr., Pleasant Lake IN 46779. Tel. (219) 475-5897. E-mail [sharon.l.brown@gte.net].

MARSHFIELD, WI The Marshfield Area ARS will hold their 10th Annual Picnic "HAMNIC" on Sun., August 6th, starting around 11 a.m. Potluck, swapfest. The location is Wildwood Park in Marshfield WI. Talk-In on 147.180. All are welcome. Contact Guy Boucher KF9XX, 107 West Third Street, Marshfield WI 54449. Tel. (715) 384-4323. Packet: KF9XX @ W9IHW.E5.AI.WI.USA.NA. E-mail [guyboucher @tznet.com].

AUGUST 12

HUNTINGTON, WV Amateur "ham" radio and computer hobbyists from all over the mid-west will be in Huntington WV on Saturday, August 12th, for a giant "Hamfest" and Computer

Show. The event will be held at the Veterans Memorial Field House, 2590 Fifth Avenue, 8:30 a.m. until 2 p.m. This event is being sponsored by the Tri-State ARA. Vendor's tables \$8 in advance, \$10 at the door (if still available). They may be reserved by calling Hamfest Chairman Dwight Smith WB8JPJ at (304) 522-7865. VE exams will be held at the Field House. Registration begins at 10 a.m. All examination elements, written and Morse code where applicable, will be offered for all classes of amateur radio licenses. A fee of \$6.65 will be charged per test. Pre-registration is not necessary but applicants must present two forms of acceptable identification, including one picture ID. Bring the original of any currently held ham license, and of any Certificate of Successful Completion of Examination (CSCE) which you claim for credit from a previous exam. For further test info, contact Garry Ritchie W8OI at (304) 733-1300.

AUGUST 13

GREENTOWN, IN The Greentown Hamfest Committee will hold the Greentown Indiana Hamfest at the Greentown Lions Club Fairgrounds, beginning at 8 a.m. Talk-in on 146.91. Vendor setup Saturday, August 12th, 6 p.m.-8 p.m.; and Sunday August 13th, 6 a.m.-8 a.m. Inside tables \$8 each. Tailgate setup \$3. Admission tickets are \$4 in advance, \$5 the day of the event. 12 and under free. Handicapped parking. If you want to take the VE exams, sign up by 8:30. Anyone who obtains a No-Code Tech license at this test session will be admitted free. Contact L.B. Nickerson K9NQW, tel. (765) 668-4814; E-mail [ka6nqwnick @ netusa1.net]. The Web site is at [www. netusa1.net/~ka6nqwnick/greentown.htm].

PEOTONE, IL The Hamfesters Radio Club. Inc., will hold their 66th Annual Hamfest, Sunday, August 13th, at the Will County Fairgrounds (I-57 Exit 327 East) in Peotone. Setup is Saturday, August 12th, from 3 p.m. to 11 p.m. Convenient unloading and parking areas. Free overnight parking. Building secured. Exhibits open at 8 a.m. Amateur equipment and computers. Flea market runs 6 a.m. to 3 p.m. No additional charge for flea market space. Saturday setup from 1 p.m. until 11 p.m. Tickets \$4 in advance w/double stub, \$5 at the gate, w/single stub. Children under 12 admitted free. For advance tickets and info, contact Christine Mack, PO Box 2161, Oak Park IL 60303; tel. (708) 358-1786. E-mail [christine1@mediaone.net]. Talk-in on 146.52 simplex, 146.64 (-107.2) STARS rptr.

SHREWSBURY, PA A Ham and Computer Swap Fest will be held beginning at 7 a.m., just off of 183 Exit 1 (Shrewsbury PA). Take Rt. 851 West 1 mile to the firehouse on the right. An old fashioned auction will be held midmorning. Mark all items to be auctioned with your call or name. A 10% fee will be charged. For further info, contact Cecil K3DCU, Fax (717) 927-9282; phone (717) 927-6662. VE exams will be held Friday, August 12th. Please call Carol at (717) 235-2738 for testing info.

AUGUST 19

LONGVIEW, WA The Lower Columbia Amateur Radio Assn., W7DG, will sponsor its 9th Annual Ham Radio, Computer, and Electronic Equipment Swap Meet from 9 a.m.-1 p.m. at the Cowlitz County Expo Center in Longview. Admission is \$4, tables are \$16. tailgate spaces are \$6. Food concessions, free parking. Overnight RV parking on the fairgrounds for \$12, electrical hookup available. Vendor setup Friday, August 11th, 5 p.m.-9 p.m., Saturday 6 a.m.-8:45 a.m. Talk-in on 147.26(+) PL 114.8. Take Exit 36 or 39 off Interstate 5 and follow the signs west for the Expo Center (fairgrounds). Mt. St. Helens and the Oregon Coast are nearby. For more info, write to LCARA Swap Meet, PO Box 906, Longview WA 98632; or call Bob KB7ADO in the evening at (360) 425-6076. E-mail to [KB7ADO@ aol.com]. Internet link to flyer at [www.qsl.net/

AUGUST 20

LEXINGTON, KY The Central Kentucky ARRL Hamfest and Computer Show will be held at National Guard Armory, adjacent to the Lexington KY airport. From I-75 Exit 115, follow signs to the airport (KY 922 south 1.5 miles, New Circle Rd. west and south 4.6 miles. to Exit 5, Rte 60 West 1.5 mile, turn south at the traffic light. Take Man O' War south 1.3 miles, Parkers Mill west 1.2 miles, right onto Airport Rd., left onto Armory grounds). Talk-in on 146.760(-). VE exams (contact Bob Cooper AF4OI by August 9th, at (606) 272-6460); or E-mail [AF401@cs.com]. Other features include an ARRL Forum, technical forums, commercial vendors, indoor flea market, airconditioned building. Outdoor flea market, powerline-safety demo, aeronautical mobile

demo, and special event station outside. Kentucky Horse Park, museums, and other family activities nearby. Handicapped accessible. Free parking. Free overnight selfcontained camping. Admission \$5 in advance, \$6 at the gate. Vendor setup Sat., 6 p.m.-8 p.m., and Sun. 6 a.m.-8 a.m. Tables \$15 if payment received before August 9th; \$25 afterwards. E-mail/phone reservations confirmed upon receipt of payment. Tailgating free with admission. For further info, or to preregister, contact John Barnes KS4GL at [KS4GL@juno.com], (606) 253-1178 evenings; or SASE John Barnes KS4GL, 216 Hillsboro Ave., Lexington KY 40511-2105.

AUGUST 26-27

ALBUQUERQUE, NM The Duke City Hamfest will be held at the Rio Rancho National Guard Armory, 4001 Northwest Loop. Take 1-25 to Bernalillo, W on NM 44/US 550 approx. 5 miles to the Armory (watch for signs). Doors open Saturday 8 a.m. until 5 p.m., and Sunday 8 a.m. until 1 p.m. Flea market, tailgating, \$5. VE exams, and forums will also be featured. Free admission. Talk-in on 145.33(-) 100 Hz. and 444,00(+) 100 Hz. RV parking, no hookups. Tables \$12 without power. \$17 with power. Contact Marcus Lieberman KM5EH. 2300 Hurley Drive NW, Albuquerque NM 87120. Tel. (505) 836-1724, Fax (505) 352-6154. E-mail [km5eh@arrl.net]. The Web site is at [www.qsl.net/dchf].

AUGUST 27

LA PORTE, IN The LPARC Summer Hamfest will be held Sunday, August 27th, at La Porte County Fairgrounds, SR2 west of La Porte, 7 a.m.-1 p.m. Admission \$5, Tables \$10, outdoor tailgating \$2. Talk-in on 146.52, 146.61(-) PL 131.8. For more details, contact Neil Straub WZ9N, PO Box 30, La Porte IN 46352. Tel. (219) 324-7525; E-mail [nstraub@niia.net]. The URL is [www.geocities.com/siliconvalley/ bvte/16531.

ST CHARLES, MO The St. Charles ARC "Hamfest 2000" will be held 6:30 a.m.-1 p.m. at Blanchette Park in St. Charles MO. Talk-in on 146.670. Free parking. No admission charge. The parking lot flea market will be limited to amateur radio and electronic items. Spaces \$8 each. Vendors, inside the air conditioned Memorial Hall, \$15 per 8 ft. table. if available. Contact Ken Fieser at (314) 428-4383; E-mail [kfieser@aol.com].

YONKERS, NY The Yonkers ARC will host an indoor, no tailgating, Hamfest and Computerfest at Saunders High School, 145 Palmer Rd., Yonkers NY. Talk-in on 146.265/.865, no PL. Sellers 7 a.m., buyers 8:30 a.m.-2 p.m. Sellers, pre-registration is \$15 per table (includes one admittance, AC power available). At the door, \$20 for first table (includes one admittance). Additional tables \$10. For

pre-registration, make check payable to YARC and mail to Y.A.R.C., PO Box 378, Centuck Station, Yonkers NY 10710-0378, Buyers, admission \$5, kids under 12 free. Plenty of free parking. VE exams 9 a.m.-11 a.m. Walk-ins okay. Bring original and copy of FCC license. original and copies of any valid CSCE. Fee is \$6.65. For more info, call John at (914) 963-1021; Paul at (914) 237-5589; or Dan at (914) 667-0587. E-mail can be sent to [w2yrc@ hotmail.com].

SEPT 10

SOUTH DARTMOUTH, MA. The Southeastern Massachusetts ARA, Inc. will hold its annual fleamarket on the club's grounds at 54 Donald St., South Dartmouth MA. The event will run from 9 a.m. to 1 p.m. Talk-in on 147.00/.60. Admission \$2, spouse and children free, Walkin VE exams at 10 a.m. Free space for vendors. For further info contact Bill Miller K1IBR at (508) 996-2969; or by E-mail to [billmiller@netzero.net].

SPECIAL EVENTS, ETC.

AUGUST 19-20

ENGLEWOOD, NJ The Englewood (NJ) ARA, Inc., invites all amateurs the world over to take part in the 41st Annual New Jersey QSO Party. The time of the contest is from 2000 UTC Sat., August 19th-0700 UTC Sun., August 20th; and from 1300 UTC Sun., August 20th-0200 UTC Mon., August 21st. Phone and CW are considered the same contest. A station may be contacted once on each band — phone and CW are considered separate bands. CW contacts may not be made in phone band segments. New Jersey stations may work other New Jersey stations. The General call is "CQ New Jersey" or "CQ NJ". New Jersey stations are requested to identify themselves by signing "DE NJ" on CW and "New Jersey

calling" on phone. Suggested frequencies are 1810, 3535. 3950, 7035, 7235, 14035, 21100, 21355, 28100, 28400, 50-50.5, and 144-146. Suggest phone activity on the even hours. 15/10 meters on the odd hours (1500 to 2100 UTC); 160 meters at 0500 UTC. For complete rules, please contact Englewood Amateur Radio Assn., Inc., P.O. Box 528, Englewood NJ 07631-

FAIRBORN, OH The Upper Valley ARC merger of Fairfield OH and Osborn OH into the City of Fairborn OH. Fairborn is the site of Wright Patterson Air Force Base (and thus the site of the Bosnian Peace Talks). Wright Memorial marks the site of the experiments by the Wright brothers that led to flight. Fairborn is also the site of Wright State University. The station will be on the air 1700 UTC August 19th to 2100 UTC August 20th. Frequencies: 3.860, 7.260, 14.260, and 28.360. A certificate is offered for a QSL with a 9x12 SASE to Upper Valley ARC, PO Box 2000, Fairborn OH 45324. Contact Lew Lewis W8OEL, PO Box 1871, Fairborn OH 45324. Tel. (937) 879-4469. E-mail [W8oel@ arrl.net].

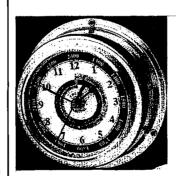
will operate Special Event Station W8F to

commemorate the 50th Anniversary of the

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ABODE & BEYOND

VHF and Above Operation

C. L. Houghton WB6IGP San Diego Microwave Group 6345 Badger Lake Ave. San Diego CA 92119 [clhough@pacbell.net]

A Safe LED Optical Transceiver System — Part 3

Well, this month let's wrap up the LED transceiver and get on with the remaining photo optical receiver circuitry. By the way, the LED used in the transmitter circuit covered last month is a Radio Shack 260 nM 5000 Mcp high-output-power LED, part #276-086, costing just less than \$3 apiece.

B asically, the receiver is a sensitive photo diode with a large cross-section area and 4-transistor amplifier that we obtained in surplus. Alternately, a diode can be obtained from commercial sources for under \$5, and an alternate amplifier using an op amp could be used here to replace the 4-transistor circuit that we built from used surplus components.

The photo diode and amp assembly is placed in the exact center of the first forward facing pipe cap assembly and has light focused on its surface by the Fresnel lens in the splice union. Again, just like the LED transmitter, the assembly is quite identical

for both receiver and transmitter circuitry. The rear cap (of the two caps cemented back-to-back) houses the local oscillator and mixer circuit that converts the 35 kHz (or 45 kHz) received FM from the photo diode amplifier to a frequency in the 2 meter ham band for reception only on my 2 meter HT.

We used a synthesizer at 145 MHz to accomplish this conversion. However, other frequencies are possible depending on what you have on hand to serve as a local oscillator as well as your choice of FM receivers for reception. A scanner will function just as well as the 2 meter HT I used. While an FM broadcast receiver would seem to

function here, its FM bandwidth is too wide for narrowband FM reception, making this an unlikely choice. With the LED being switched at a rate above 50 or so kHz, efficiency drops off, making wider modulation schemes impossible with this design.

In our system, we used a synthesizer to produce an LO of 145 MHz for injection into the LO port, pin 8. and ground of a SBL-1 mixer to convert the 35 kHz IF to 145.035. The output of the converted photo diode detector amplifier assembly feeds the IF port, pins 3 and 4 tied together, and common ground of the SBL-1 mixer directly. The RF port of the mixer, pin 1 (blue pin), and ground is the coaxial connection to the HT's RF connector. The SBL-1 mixer has pins 2-5-6 and 7 all tied to common ground. Again, pin 8 is LO input, pin 1 is RF output, and pins 3 and 4 are the common IF input.

I have used many different other agile sources of RF for LO injection to the mixer, replacing the synth on a trial basis. Any good signal generator that is stable enough to be held on frequency for narrowband FM work would do for a bench test. It would seem that a simple crystal oscillator circuit that is used for a 2 meter converter could be duplicated here to replace the synthesizer circuit. The frequency of the circuit needs to be changed from the original circuit that appears in almost any ARRL Handbook on VHF 2 meter converters. Just the crystal oscillator circuit needs to be built with a suitable crystal for the frequency desired.

In another test, I tried a TTL oscillator at 78 MHz and coupled it to a MMIC amplifier. Not only did it amplify the 78 MHz, but it also proved to be a good 2nd harmonic generator at 156 MHz. Using 156 MHz unfiltered for other harmonics and 78 MHz I

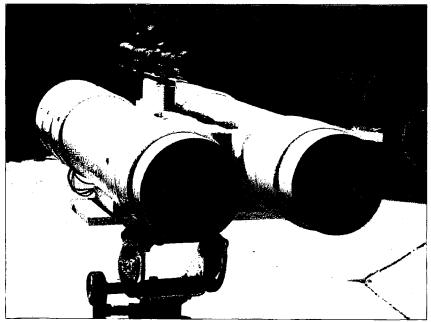


Photo A. Front view of entire system showing spotting scope on top, centered between the receiver and transmitter 4-inch assemblies. Visible just inside the front of each tube is the Fresnel lens in the splice union coupling.

tried readjusting my wide coverage HT to the commercial FM band (150 to 174 MHz). I set it to 156.035 MHz and it worked as well as using the synthesizer and 2 meter portion of the HT frequency range. Harmonic output of this 78 MHz crystal oscillator was quite good, giving full scale S-meter reading in my back yard with just the crystal oscillator powered up on my workbench. Stability on my FM HT at 156 MHz was quite good.

The TTL oscillator is powered from +5 volts DC at a few mA, and puts out .8 volts p-p or just about zero dBm as measured on my 432 HP power meter. Duplicating pin pattern for a standard 14-pin IC, pin 1 is DC ground, pin 6 is signal RF ground (can be common ground connected). Pin 7 is +5 volts DC, and pin 14 is 78 MHz RF output.

Whatever circuit you use, be it the 2 meter converter crystal oscillator circuit or the TTL crystal and MMIC design, either one will work well for you. This simplification of the circuitry and component parts required will help to hold down parts count. eliminating the more complex synthesizer. The reason I tried the 78 MHz TTL crystal oscillator is that I came across a quantity of 78 MHz TTL oscillators and they seem to work well. If you have any TTL oscillators in the junk box, give them a whirl - it might work. Remember, this is just a suggestion, as there are many other frequency combinations that will work just as well. Put the junk box to use if at all possible.

The TTL oscillator is a quite simple 4lead device looking much like a IC that fits into a standard IC socket. They are a complete oscillator circuit and crystal all enclosed in a miniature metal can. Mount the oscillator dead-bug upside down on a small piece of PC board next to the MMIC amp capacitor coupled to the MMIC input. A DC supply resistor and output coupling capacitor complete the LO TTL oscillator. A short section of miniature coax couples RF out of the MMIC amp harmonic generator to the LO port of a SBL-1 or similar mixer.

The photo detector we used was obtained from surplus and had a four-transistor amplifier as part of the assembly. The photo detector/amplifier was chosen because it had a large surface of active light detection area about 3/16 of a inch square. This assembly used a detector that was not obscured with a dark red infrared filter. If the detector you obtain is covered with a molded IR filter on the detector, a suitable replacement photo diode can be obtained from Newark Electronics (see **Photo C** caption).

The surplus photo detector/amplifier assembly we obtained was not filtered (for IR), making it very usable over the LED



Photo B. Original photo detector obtained in surplus. Note the photo diode near bottom left. You can see active element for photo detect in visible light. If it were for IR use only, it would be obscured with a very deep-colored RED lens.

visible frequency range. The units with a IR diode and IR filter (very dark red) are not usable as far as the photo diode is concerned. See Fig. 1. The photo diode should be clear in appearance, allowing you to see the dark photo sensitive element in the device. See Fig. 2 for the reverse-engineered schematic of the photo detector amplifier and the conversion to the output transistor amplifier circuit. This converts

Continued on page 46

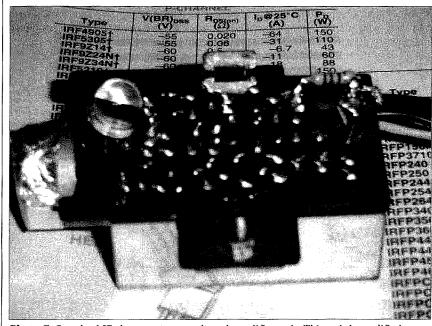


Photo C. Standard IR detector (removed) and amplifier unit. This unit is modified to experiment with the Newark Electronics photo diode (#95F9029, p. 583, Newark Electronics cat. #117). As you can see, the Newark Electronics replacement photo diode has a clear white plastic lens. The Newark photo diode replaced the IR diode as received in surplus. Same 1k emitter mod on final transistor amplifier stage.

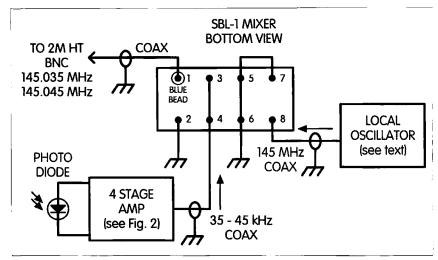


Fig. 1. Optical receiver/converter schematic.

ABOUE & BEYOND

continued from page 45

from digital to analog for use with our FM application.

The conversion is simple, as the original transistor emitter is grounded and needs to have ground broken to the emitter, to be replaced with a 1k resistor. Output is not the collector as in the original circuit, but converted to an emitter follower by coupling out of this last stage on top of the 1k emitter resistor coupled with a .001 µF capacitor.

Alternately, if you can't locate an IR detector assembly, an alternative could be a suitable photo diode and constructing an amplifier using a common op amp. While improved designs use high performance op amps, most of these amps are hard to locate. The op amp design is not critical —

it's your choice. See what you can come up with from the junk box. A good junk box will cut costs.

With this design, I hope you don't follow exactly what I used, but rather use it as a guide. I used what I was able to find in my scrap metal and surplus dealers for low cost assembly. You're quite welcome to follow exactly but try where possible to use alternatives from locally available components to reduce your construction costs. In that way, you should use this as a guide not as an absolute to-follow-at-all-costs design.

The output .001 µF capacitor of the photo detector amplifier is coupled to the IF port of an SBL-1 mixer. Now, amplifying light might not seem proper using common RF components, but remember what we are actually amplifying is the LED's light output chopped at 35 kHz rate. That's the RF

Fig. 2. (a) Reverse-engineered drawing of converted surplus IR diode detector and 4-transistor amplifier. (b) We converted the output stage by removing ground on the emitter and coupled out of the emitter with a .001 μF capacitor.

carrier with the FM modulation superimposed on this carrier frequency. That's why we had to modify the transistor amplifier output stage to analog to pass without distortion the carrier and its FM modulation.

The local oscillator, be it a signal generator, synthesizer, or TTL crystal oscillator MMIC amplifier, is injected to the local oscillator port (LO) of the same mixer. The HT antenna is connected to the RF port via miniature flexible coax cable.

Startup tests were performed inside a garage, focusing the LED transmitter on the inside of the garage door and setting the TX optics for best spot focus. Turn on the receiver and connect the HT tuned to your receive frequency (RF earrier + local oscillator injection frequency). The RF carrier is either 35 or 45 kHz and your LO is 145 MHz with the synthesizer or 156 MHz if you used the 78 MHz TTL crystal source. If all is functioning, you should have a full quieting signal of the HT receiving your RF being generated from the LED transmitter. For best return signal, you might have to target a plastic bag or some reflective surface to give a return reflection.

Further tests include peaking up the system using a remote reflector mounted quite a distance away, say, 200 or so feet distant. Auto rear backup light reflectors make a great target also. Aim the LED transmitter at the reflector, and when the transmitter is being reflected (very noticeable) by the remote reflector, signal strength on the HT should be nearly or completely full S-meter deflection. Align the spotting scope and target in the scope's crosshairs first for a coarse adjustment. Then peak up system performance using an attenuator in the HT path to reduce overloading. Use the S-meter to peak up on. At the same time, the final rifle spotting scope adjustment is done by slightly loosening the vertical and horizontal calibration screws on the scope mount. Then, move the scope and position the scope crosshairs, aligning the scope on target with the LED transmitter being reflected by the reflector target.

If all is well after this initial alignment, re-verify mount rigidity, as it will be subjected to some stress when the whole unit is moved to a remote location for further tests. I suggest moving out the distance attempted from a modest test at relative short ranges to greater and greater ranges as system sensitivity suggests. Try across a school or park open space first or up and down a city block first before trying a greater distance. If S-meter readings are still way up there, go for a greater distance. We tried 2 miles and made it on our first attempt. This,

after great care was given to align the LED and detector diodes in the center of the respective housings and making a careful focus of the Fresnel lenses for best focus sensitivity.

These tests were made at night and from nearly black background areas. To locate each other, a very bright flashlight was blinked on and off. Just like using microwaves, if you are using a narrow or few-degrees dish antenna and you're not pointed at the correct heading, you won't make contact.

When you have contact, you can visually observe the LED transmitter at the remote location. The LED system looks like a bright porch light - colored red, of course. Not overly bright, as observed at a 2 mile distance. You immediately wonder if this thing will function at this distance at all, being as dim as you optically observe this light at this distance. In practice, these units can still have detection (noisy) when slightly off direct aiming. If you use an SSB HT for lineup, this allows you to detect a CW tone from the carrier and use this tone to peak up the pointing angle as compared to relative tone strength. This tone can be fed back to the transmitting location to facilitate alignment using the SSB receiver feeding back this tone over the communications liaison system. We use 450 MHz simplex frequencies to prevent having anything locally in the VHF 2 meter IF band used in this optical transceiver.

Did I forget to mention using a good tripod for the system? We use the same tripods for this system that we use for our microwave dish antenna mounts. Whatever tripod you use, we suggest a heavy one much heavier than a standard camera unit. Camera tripods could be used; however, they are not as sturdy as a microwave tripod.

Also when setting up at night, be sure to bring a small llashlight for local use to check setup in the dark. A useful light is an old military signal llashlight with red colored filters over the flashlight bulb to retain some of your night vision, allowing you to look through the spotting scope. It's not a necessary item, but a thought. For a liaison radio, we used our 450 MHz FM HTs on a simplex channel for communications setup as they're much better than arm and hand signals.

A nice addition to this liaison communications setup is a Radio Shack VOX headset boom mic, part #19-312. The cost is \$50 - much less than others on the market. Its use allows hands-free operation for work on the optical system and communications over the liaison channel while setting up. The VOX operation is very nice, and it

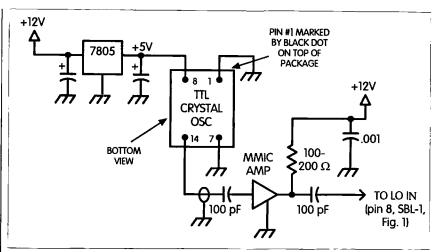


Fig. 3. LO constructed from 78 MHz TTL crystal oscillator and MMIC (driven hard to produce harmonics) used for LO injection at 2nd harmonic for 156 MHz reception of the LED transmitter, 35 or 45 kHz modulation.

seems to be able to be used on many different HTs that not only include a whole series of Icom radios, but also Alinco, Yaesu, and Standard models, according to Radio Shack catalog details.

Don't forget to bring along some of the creature comforts like a lawn chair. You might have a wait for total setup and there is nothing like being comfortable.

Well, there is the entire system that Kerry N6IZW and I constructed.

Of course, there are improvements that can be constructed and added on to this system. The tripod head we used had a return spring that somewhat argues with the manual positioning of the tripod in fine positioning settings. Just could not set on to a spot but near it. It was like there was backlash in the mechanism. I suppose in its original use this tripod that we used was in reality a TV camera tripod. The return spring was a great device with such a heavy camera. For our system it was removed, and we use the horizontal and vertical locking screws. This made life easier for finer pointing when using the rifle scope crosshairs to align scope and target together.

Well, that's it for the system. I hope you have as much enjoyment as Kerry and I have had in this project. It just goes to show you that some things that seem impossible are just not so. They might be, but until you give them a whirl, you will never know. I have located a quantity of 78 MHz TTL crystal oscillators and will make them available for \$2 postpaid.

For laser topics and lots of information and suppliers check out Web address [http:/ /www.qsl.net/k3pgp/opening.htm]. Our final plan is to use the system during the ARRL 10 GHz and up contest for fun, should my KNEES allow me to do so. Best 73 for now, Chuck WB6IGP.

Depression is merely anger without enthusiasm.





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Mobile, Portable and Emergency Operation

Steve Nowak KE8YN/4 1011 Peacock Ave. NE Paim Bay FL 32907-1371 [ke8yn@netzero.net]

Now That You've Upgraded, What's Next?

First, I'd like to congratulate those of you who have recently upgraded. With the standing-room-only response to the opportunity to upgrade to either General or Extra, tens of thousands of us took advantage of the opportunity. After dutifully cracking the books (or the computer tutorials), and armed with our pencils, erasers, and calculators, we dutifully presented ourselves at the VEC sessions and attacked the examination booklets.

Of course, in the process we managed to totally overload the system, so actually getting your new license has been an opportunity to learn patience. As I write this, it has been six weeks from the April fifteenth stampede, and the VECs are working diligently to get the backlog of upgrades submitted to the FCC. While you may not have your new grant as of the time I write this, I figure that by the time you read this we should all have our upgrades in hand.

I suspect that in addition to those who upgraded we also have a number of folks who have recently joined (or rejoined) the hobby. When the requirements changed, many who had not taken the plunge may now choose to do so. Predictions were that as new folks enter the hobby we might be seeing a shift in the reasons people have for joining the hobby. Ten years ago, there were many who became hams because amateur radio provided a cheap and effective means of communications. Now there are many alternatives to meet that particular need and people join the hobby for other reasons. With so many modes, modalities, and options available, we may begin to attract the experimenters who have become tired with the limits of surfing the Web. Others who have gotten into the habit of assembling their own computers may see ham radio as a natural outgrowth of the desire to build. In any case, congratulations or welcome, whichever the case may be.

Now that you have your new license, or your upgrade, what are you going to do with it? Don't forget that there is one thing that sets this hobby apart from most others. We routinely have the opportunity to provide real and meaningful support and assistance to others by using our hobby. We can give something back to the community that may

fill a critical and emergent need. With this opportunity comes an obligation, not to mention a proud tradition, of public service. In the past I've written about a number of things that we can do for the community. whether communications during a disaster or during a bike ride. Maybe we're helping out with a food drive or even providing backup communications within a hospital when they experience telephone equipment problems. Then it hit me. We often think of our role as one where we provide communications for various agencies, but our role is actually quite a bit more important. As communicators we provide the data that people need in order to act during a particular situation. We understand that this data is the lifeblood of any operation, and we spend a lot of time planning and preparing to meet that need.

As hams we spend a lot of time practicing for events that might occur - or then again (and hopefully), they might not. We practice for disaster support and recovery communications through our Amateur Radio Emergency Scrvice (ARES) and Radio Amateur Radio Civil Emergency (RACES) networks. Those affiliated with the Military Affiliated Radio System (MARS) practice the skills which might be needed to assist and support armed forces communications. We develop and maintain skills which are not required for the enjoyment of the hobby but which would be needed if called upon to serve in one of these capacities. It struck me recently that while many people want to help out in times of a serious problem or emergency, relatively few are geared toward investing time and effort in the anticipation of such an event. Many homeowners do not prepare their own home for an emergency, and therefore would not be inclined to prepare on behalf of their community.

Perhaps they feel that someone else will do it. Perhaps they feel that that's why we have a Civil Defense function. As it turns out, that someone else is us. When we register with a local or state agency and function as a RACES station, we are, by definition, a component of Civil Defense.

The key is that in an emergency the most effective hams are those who are also the planners. Some hams are ready willing and able to assist in a real emergency but cannot or may not choose to participate in the planning and preparation. While these folks are important, without the planners, it would be difficult or impossible to assimilate these folks into the event when it occurs. This is especially true since most disasters by definition occur with little or no warning. So how does that affect you as a ham, particularly if you have recently joined the hobby or upgraded?

- I. Get involved to the degree that you can. Check out the local ham club and find out who is coordinating the public service communications. Get to know them. Let them get to know you and what you are interested in.
- 2. Be available when possible. You may have a demanding job, and it may take priority during an emergency. Police, fire, and hospital employees will have their hands full in a disaster, but there are many other events in which you can participate. The local fun run or marathon may be such an opportunity that allows you to participate but which doesn't conflict with your other duties in an emergency.
- 3. Get involved. Participate in planning for the types of events that may impact your area. Go through SkyWarn training. Register with the local public service agency as a

Continued on page 61

Low Power Operation

Michael Bryce WB8VGE SunLight Energy Systems 955 Manchester Ave. SW North Lawrence OH 44666 [prosolar@sssnet.com]

Electricity at the Speed of Light

At the 2000 Dayton Hamvention, I picked up a second Heathkit HW-8. This one is really nice looking with hardly a scratch on it. I really did not need another HW-8, but the price was reasonable and the condition of the radio made it a got-to-have.

The guy behind the table say it would L only work on 20 meters. All the other bands were dead. There was no receive or transmit. So with an exchange of some dead presidents, the HW-8 was mine.

A look inside

After I got home from the Hamvention, the HW-8 got its time on the workbench. I powered up the HW-8 and sure enough the guy was correct. It only worked on 20 meters. There was no transmit at all on any of the other bands. The receiver was also guiet on 80, 40, and 15 meters. All I could hear was the audio hiss in the earphones.

As I looked around at the PC board, I found that out of twelve of the compression trimmers, only three had their adjustment screws. The rest were missing. Now, why on earth would anyone want to remove the adjusting screws from the trimmers? I've still not been able to figure that one out.

Also missing, or rather destroyed, is the slug in the L19/L18 coil. This is one of the heterodyne oscillator coils. If this coil is out of adjustment, the circuit it controls will not function. In this case, L19 controls the operation of the 20-meter oscillator. The other half of this coil controls the 40-meter oscillator. Since the slug for the 40-meter band was in crumbs, it told me that someone someplace was working on the heterodyne oscillator. It also told me that they could not find the problem by adjusting the slug in L18/L19.

Checking the heterodyne oscillator

Heath wants you to use an RF probe to check for the proper operation of the heterodyne oscillator. The test point is TP1 and is located on the diode side (as looking down onto the PC board) of R94. I have found in the past it is best to couple an oscilloscope to this test point and forgo the RF probe. The scope will not only show you the output level of the oscillator but also what the waveform looks like. Sometimes more is not better!

So, couple your scope probe to R94. As you select the different bands via the front push-buttons, you should see a nice waveform on the scope. There should be at least 50 mV p-p on the scope. On this radio, none of the crystals would fire except on 20 meters. Since Q7 and Q6 are the only active devices and they both work on 20 meters, there had to be another problem.

The HW-8 is full of switching diodes. They control the various tuned circuits. We've talked about these diodes in the past, and I won't go into great detail here again. Enough to say that if one or more of the switching diodes is kaput, then the section that is controlled by those diodes will not function.

On this radio, the switching diodes controlling the heterodyne oscillator were all working. This test is simple. Use your VOM and check to see if plus 12 volts is routed via the diode to the crystal.

The front panel push-buttons do much more than direct the 12-volt switching voltage to the various diodes. They do in fact route the antenna to the front-end amplifier. They also route the output of the PA to the various output filters. These push-buttons have wires on the top and connections via the PC board on the bottom. I mention this because I found while checking the switching diodes that I had 12 volts on the green wire leading from the 20-meter switch even though the 80-meter button was in! The color codes are from the Heathkit manual and allow you to trace the various switched circuits. The color code is: black for 80 meters; red for 40 meters; green for 20 meters; and white for 15 meters. This color-coding holds the same no matter if the wire goes to the front end or to the PA stage.

While we're at it, looking into the front of the radio, the leftmost push-button is: 80 meters SW1; 40 meters SW2; 20 meters SW3: and 15 meters SW4.

Each SECTION of any of the push-button PINS are numbers like this. The section closest to the front panel leftmost side, pins 10,11,13; right side, 1,2,3. Middle section, pins 13,14.15, right side, 4,5,6. End section, pins 16,17,18; right side, 7,8,9.

The sections are lettered. Again, for the front panel, RIGHTmost switch (the 15meter button), the section closest to the front panel is section A. Middle section is B, and the last section is C. This sequence is repeated on all the switches. So, 80 meters can have section D, E, and F, with pins 1,2,3, and 10,11,12.

Now having said all of the above, a quick touch of the soldering iron detached the green wire from the 20-meter switch. With this wire no longer connected to the heterodyne oscillator, the other crystals fired right up.

No matter what switch was pressed, the wire going to the 20-meter band was always hot with 12 volts. The problem was finally traced to a shorted switching diode in the front end. As it turned out, diode D7 was at fault. Here's what happened. When any other band switch was pressed in, the switching voltage was applied to all stages. In this case, we'll select the 80-meter band. With the 80-meter button in, 12 volts is applied to select L5 via D5, C2 and L1 in the front-end circuit are now active thanks to diode D1. At the same time, D22 is turned on and places Y1, 12.395 MHz, in the heterodyne oscillator. And last but not least, diodes D31 and D35 are forward biased and

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Zakanaka

You may take it as a given that I have all the latest technology on my operating desk—especially when you read that I recently purchased one of the high-end transceivers. Surely, then, I must have all the latest whizbangs computer money can buy, non? Not even close. I seem to stay in touch with reality in a lot of areas, at least from my own perspective, but I must work within a budget.

S peaking of expensive. I have watched the \$400 rebate campaigns to get everybody down to the store to purchase new computers and have firmly dug my heels in. Do the math. That rebate will commit you to something close to an additional \$400 out-of-pocket by the time you are finished with your commitment.

Now that I have spouted off, I still haven't told the deepest secret about my shack's time-worn computer. It is a long way from cutting-edge at 120 MHz and 32 megs of RAM. A few years ago, that sounded pretty good. After all, this machine has been upgraded several times since it was purchased new with Windows 3.1 as the operating system!

Way back in those dark ages, the first configuration had a 486 processor and the attendant goodies. Seemed pretty high-end, then it went downhill — or perhaps the hill just got taller.

Where am I going with this? It just happened recently that one of the newest pieces of ham software won't run correctly on this machine. That started me to thinking about you guys. And I notice there are hams running computers similar to what this computer was when it was hatched six or seven years ago.

First, let me state that there are some programs that will do very exotic jobs on fairly "slow" machines such as a 486 33 MHz. For instance, if you wish to run PSK31, the original Peter Martinez G3PLX package will usually do the trick quite nicely if you are running an earlier configuration with Windows 3.1. The latest version, 1.08, is available via the URL listed on the 4th line in The Chart.

I use it on my laptop (Win95) with the WD5GNR front end and it is quite respectable. The laptop might handle one of the

more "hungry" pieces of software, but I am satisfied with the performance. The tuning leaves a little to be desired, but it works for a lot of folks. Once it is on frequency, the rest works like most any other program.

There are other programs for other modes that will perform on these machines. Usually, if you are looking for such software, the best bet is to find DOS applications. Often, they are more stable and make a slow machine come to life. One of my favorites for SSTV is the Pasokon Lite package. It is a DOS program that really does the job on the laptop. Incidentally, the laptop is another "cripple" at 120 MHz and only 8 megs of RAM.

What brought all this thinking to a head

I have mentioned the new Zakanaka PSK31 software by Bob Furzer, the author of Logger. Bob decided to build a separate standalone PSK31 program that would work in conjunction with Logger so the latter could do as its name implies, log contacts. He found that the logging program with the PSK31 module had gained a lot of popularity due to the inclusion of a PSK31 module.

That was the very reason I first downloaded the Logger software. At the time, it was one of the most attractive programs for working the new mode, and the logging capability was built-in. I very likely wouldn't have given the software a second look if the PSK31 module were not offered.

Now you will find both programs at the revised listing in The Chart. I was made aware, a few months before this publication date, that the old URL I had listed for acquiring Logger, which was a very interesting site with many ham links, had gone by the wayside. So I am at present supplying the

correct URL via E-mail and this new listing should relieve some of that traffic. I do enjoy hearing from all of you, but the error rate from this end becomes a bit embarrassing in cases like this.

As soon as the first version of Zakanaka was available, I downloaded it and it worked very well, especially considering it was a first release. Obviously, a lot of effort went into the program. Not only had Bob written a fine piece of software, but a dedicated crew of volunteers worked up a magnificent help file.

I managed to work a few stations with the software and figured I had the cat by the tail. Then I read about running Logger concurrently with the new software. At that time, there was a new version of Logger available (ver. 7.05), which I downloaded and installed. I did a little checking and that program appeared to work quite well as a standalone.

Then I got the two programs running side by side and the really big problem developed. Crash — reboot — crash — etc. Actually, the programs would run long enough to make me think there was just some little quirky bug floating about. My comment later was that I had enough crashes that day to fill a computer junkyard.

Another confession

I must apologize for misleading anyone on the ease of using some of these "hungry" programs. After the above incidents, I went to the Zakanaka reflector and described my woes in enough detail to expect a reply and, of course, I was hoping for a simple fix.

I did receive several replies. Most of the authors of the replies gave me some goodnatured chastising for not reading the help files which clearly state the programs require a minimum 150 MHz processor. Some of the chastising was not so goodnatured, while other folks were downright sympathetic to my plight.

Throw money at the problem!

The end advice was to either use other software or buy a "real" computer. I tried to avoid being discouraged and mulled the options. Mulling, in case you have not done much of it, can hurt the head as much as regular old-fashioned thinking.

I had tried most, but not all, of the software available and decided I would make an investment that was more practical than the recommended "new computer" purchase. Though it would be nice to have something fast enough to run just about any job, in reality, this old machine does everything I ask of it and I can not only put off the purchase of hardware, I can avoid all the time-consuming configuration at least until sometime in the future. Such loyalty ... if computers talk to each other, can you imagine how jealous the others are?

Source for:	Web address (URL):		
Soundcard program for PSK31, RTTY, more	http://tav.kiev.ua/~nick/my_ham_soft.htm		
TrueTTY — Sound card RTTY w/ PSK31	www.dxsoft.com/mitrtty.htm		
Pasokon SSTV programs & hardware	www.ultranet.com/~sstv/lite.html		
PSK31 — Free — orig. PSK31 — also Logger	http://aintel.bi.ehu.es/psk31.html		
Site with links to PSK31 and Logger 7. Also Zakanaka and scope program	www.chroniclenetworks.com/~dwm/Logger.htm		
PSKGNR — Front end for PSK31	www.al-williams.com/wd5gnr/pskgnr.htm		
Digipan— PSK31 — easy to use — new version 1.1	http://members.home.com/hteller/digipan/		
TAPR — Lots of info	www.tapr.org		
TNC to radio wiring help	http://freeweb.pdq.net/medcalf/ztx/		
ChromaPIX and ChromaSound DSP software	www.siliconpixels.com		
Timewave DSP & AEA products	www.timewave.com		
Auto tuner and other kits	www.ldgelectronics.com		
XPWare — TNC software with sample DL	www.goodnet.com/~gjohnson/		
RCKRtty Windows program with free DL	http://home.t-online.de/home/dl4rck/ [use lowercase DL4RCK]		
HF serial modem plans & RTTY & Pactor	http://home.att.net/~k7szl/		
SV2AGW free Win95 programs	www.raag.org/index1.htm		
Source for BayPac BP-2M & APRS	www.tigertronics.com/		
BayCom — German site	www.baycom.de/		
BayCom 1.5 and Manual.zip in English	www.cs.wvu.edu/~acm/gopher/Software/baycom/		
N1RCT site — excellent RTTY ref.	http://www.megalink.net/~n1rct/		
Int'l Visual Communication Assn. — nonprofit org. dedicated to SSTV	www.mindspring.com/~sstv/		
Creative Services Software	www.cssincorp.com		
Hellschreiber & MT63	www.freeweb.org/varie/ninopo/iz8bly/index.htm		

Table 1. The chart from Hell(er) — your guide to good things on the Web.

The software of choice is the MixW package that I reviewed last month. I wrote the article for last month using the demo version of the program, and it seemed to do well. The demo version installed easily and, once I got past the series of operator errors, the performance was excellent.

This should mean the installation of the

This should mean the installation of the "real" software should be a snap, right? Well, there was a difference and it did give me a few fits for a time. I learned a partial lesson about a resident file labeled Wininet.dll. I didn't really want to learn about this, but this is what I found, and I doubt it will happen to you.

The MixW program comes with a regular Windows95TM Install mechanism and the installation goes like clockwork ... except ... I messed with it. I have a partitioned hard drive and I changed the installation address to the "G" drive rather than the default "C." My C partition is a bit overfilled.

Education — no extra charge

This shouldn't make a difference ... or so I thought. Well, a hitch developed in the get-along. The program would display an error message on boot-up. The message was based on the .DLL file I mentioned. I did a little checking and at the Microsoft Web site there are listed about 100 incidences of complaint on the little-wonder file.

Apparently nobody had reported such a problem to Jim WA2VOS, who handles the paperwork for this software. He seemed to feel I should not have messed with the installation process.

I wasn't desperate yet. I decided the problem could simply be that the file was the wrong version to work with the software. I copied a different version of the file from the laptop, but soon found I was in trouble when I went to rename the file in the desktop. Access denied. I thought of one method I hadn't tried for access after I posted the details of the problem on the MixW reflector.

Hams to the rescue

Shortly after the posting, I checked back and there was a message from Nick UT2UZ, the author of the MixW software. I still don't know all there is to know about that file, but Nick sent me a fix to install that cured the problem in just a few minutes. This was a day when I lacked the time to work steadily for a solution.

So finally, at midnight, as I was configuring a few macros, I noticed a strong signal from out Tokyo way, gave it a call and bingo, I was in business. Excellent report, even with the beam in exactly the wrong direction.

The point of this is there was an attitude of helpfulness with this problem. I appreciated the effort extended by Nick to supply a fix. I am sure he had a few other things going on in his life just as I had that day, but he came to the rescue in the true ham spirit.

So, you may wonder, why would I actually pay cash for a program to work PSK31 when there are so many freebies out there. I wasn't really retaliating to the admonition to get with it and get a modern computer (though that was an incentive). The MixW software also has a logging system and, of greater interest, it also does RTTY (very well), has two new modes, FSK31 and MTTY, and it will also send and receive packet on HF and VHF.

It appears there is more development on the way, because there is a "Pactor Listen" function so it will copy Pactor and, just for fun, it also copies Hellschreiber. I don't claim to have any inside dope on what is in the future for the program, but it looks like a very promising project.

New modes to experiment with

I haven't had the time and patience to try the FSK31 or the MTTY mode. I have observed others on the MixW reflector attempting skeds to experiment and just a few, at this writing, have managed to make contacts. The advantages of these modes will probably be better known as time marches to its tune. I will let you know.

And along came Zakanaka

The new Zakanaka is worth looking into. The download and installation goes well. And I have managed to run it successfully as long as I do not run Logger at the same time. That may seem to defeat some of the purpose of the package, but in the interest of seeing what's new, a little effort is justified. After all, if logging is important, a few pencil notes and a later entry is not all that bad.

I snapped a screen shot of Zakanaka in action (Fig. 1). One of the more impressive features is the full-width tuning display. The screen shot shows three signals in the display. There were probably more that were not displayed due to the limitations purposely placed by the radio's filter at the time.

Any of the signals can be instantly tuned by clicking with the mouse. The one currently tuned is the one on the left, as indicated by the two parallel lines just above it. The other tuning indicator in the upper right of the receive screen is reminiscent of the Logger PSK31 module's tuning system.

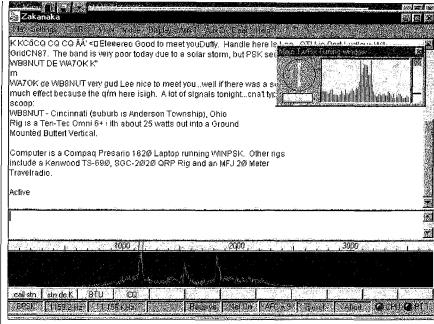


Fig. 1. The first release of the Zakanaka PSK31 program. All the bells and whistles were not in place at this time, but there was enough there to use the program, and it works well. It is intended to be run with Logger in the background so the programs can interact. This setup requires at least a 150 MHz processor and "lots" of RAM. Since my computer doesn't qualify, I could only evaluate the one piece of software at a time. The full width tuning display at the bottom is as easy to use as any and the help file is well written. See text.

This smaller indicator can be clicked and dragged elsewhere to suit your fancy.

The programmable buttons just below the main tuning display are to be programmed and named by the operator. In practice, three times as many buttons are available by choice of the setup. They are activated by mouse click. I feel the need for several basic macros to save typing callsigns that I forget in the course of a contact.

It had been several weeks since I made up the few macros seen here, and I have to tell a little story on myself. I couldn't recall which programs snag callsigns with a double-click in the receive window. I saw a station calling CQ, double-clicked on the callsign, and didn't see evidence of it being stored on-screen. (This was the first beta release.)

Next, I clicked the "call stn" button and found that not only was the calling stations callsign already in the macro, but I had also programmed the key to not only call the station but go automatically into transmit mode. I was just about to make a contact, I thought, and all the time I was just looking for material about the program. Conditions weren't too good and a station that was closer to the station calling CQ won that one. Well, I learned what that double-click would do. I imagine future releases will

make the operator aware of what is going on "behind the scenes."

Anyway, even if I can't convince my little weakling computer to use the new system in its entirety, it is a good working piece of software. I have to admit that. One of the nonfunctioning areas of the program due to computer limitations is the transceiver frequency, which should be displaying in one of the boxes at the bottom left of the screen shot. That display works in conjunction with the Logger program which polls the transceiver — then the Zakanaka program takes the information and displays it. I did experience that before the series of crashes mentioned earlier.

More to come

Of particular interest, in the "Mode" pulldown menu, there is a RTTY choice listed. There is no RTTY module as yet, but it may give some idea where this piece of software is headed. Looks like an ambitious undertaking.

Also, the QSO information as gathered by Zakanaka is somehow stored in the Logger program when they are running concurrently. Gee guys, this sounds so good I am

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Radio Direction Finding

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RDF Tracks Critters and Bugs

We hams call it "foxhunting" when we use direction-finders to search on foot for radio transmitters hidden by our fellow hams. But hunters of real foxes now use RDF, too. From stolen cars to Alzheimer's patients to missing children, there is a lot that people want to find and keep track of by radio direction finding (RDF) nowadays. Hardly a week goes by without my getting several requests for information on tracking systems for various uses. Today's mail brought two.

One inquiry was from the owner of a business, wanting an RDF solution for expensive tools that "wander off," to quote him. The other writer wanted "a homing device 3/4-inch long and 5/16-inch diameter." He didn't give any information about intended use, range, transmission duration, or anything else that might help me answer him.

From the beginning, I have tried to respond to every inquiry, no matter how vague or outlandish. I have learned a lot in the process.



Photo A. "Finds hidden transmitters! Ensures privacy." That's what it says on the NCG RF Bug package.

One of the most memorable letters came just after "Homing In" first appeared in 1988. Tracy from Kansas wrote: "I have a friend who needs help with tracking his coonhounds. He says when they get out of hearing distance, it sometimes takes all night to find them. Yeah, I used to laugh too, until I heard how much money, prizes, and stud fees a good coonhound can bring in. By the way, we like to build from used parts, to help hold down costs."

I suspected that someone was pulling my leg when I saw this postscript: "Dorothy and Toto send their love." Nevertheless, I answered as best as I could at the time, something about looking into the animal tracking tags used by university researchers.

As it turns out, Tracy was completely serious, and I soon learned that other dog owners have similar needs. Helping them has created a thriving business for at least one company. Gary Tripp of Grifton, North Carolina E-mailed a few months ago to say that 73 Magazine and my RDF book helped inspire him. "I really enjoy your 'Homing In' articles," he wrote. "They have served as a valuable resource in my transmitter and receiver development. My copy of Transmitter Hunting — Radio Direction Finding Simplified [Moell and Curlec, TAB/McGraw-Hill, ISBN 007-1560068] is well worn." I had to find out more, so I called him.

Gary doesn't have his amateur radio license yet, but he has a strong interest in ham-related technologies. "North Carolina State did a telemetry study on the deer population in my state in the early '70s," he explained. "I was just a kid at the time, but the radio tracking was interesting to me."

Magnum Telemetry, the company that Gary started about six years ago, makes rugged miniature VHF transmitters and the equipment for tracking them. "We've done projects for fish and wildlife services in just about every state, and we've even had some international business," he says.

The majority of Gary's customers are individuals who own hounds for sport hunting. When the dogs are following the scent of an animal such as a fox or raccoon, they may run several miles away from their owners. Radio tracking allows the humans to catch up and to round up any hounds that stray from the pack.

Hounds in the Bible Belt

Although Magnum has customers from Canada to southern Mexico, most are in the Bible Belt, as he puts it, from Virginia to Louisiana. "That's where the foxhunters and coonhunting fraternity live," he told me. "Other customers are hunters of cats (mountain lions), bears, and the like. They also use hounds, and they're spread about in the parts of the country where those animal populations exist and it's still wild enough that they can pursue them.

"There's two disciplines," he continued. "One is exactly as existed in old England and was brought to the USA by Thomas Jefferson, George Washington, and other rogues of that era. Other than the fact that the land they use is dwindling due to the population increase, foxhunting is exactly the same as they've practiced it for hundreds of years. We don't have the same amount of game available nowadays, but it's done in the same way.

"We go out as a group. It's a social event. We're hunting in large tracts of timber, so it's rare to be seen by the general public. In some states it's illegal to pursue game with hounds, but here in the Bible Belt it's very popular, a tradition for years and years. My

great-great-grandfather hunted, and all of us since have.

"In Kentucky, some foxhunters ride \$50,000 horses and have huge packs of hounds. They hire houndsmen that are paid year-round to keep up their hounds. On a horse, it's sort of a different story than RDFing out of a pickup. You can't mount an antenna on a horse. Typically, a mounted hunter uses a hand-held yagi with a fairly short coax and the receiver in his pocket. It's a folding yagi and we offer a little nylon case for it that will attach to a saddle. Almost all use the receiver's speaker — very few use an earphone.

"There's another foxhunting group that's totally different. They are actually there primarily for the hunt, though only in about one out of 200 trips would they actually kill a fox. They're in it for the chase, though, and that's the exciting part for them. I guess it's the same as it is for you hams pursuing a hidden transmitter. They use their pickups and CBs, but they hunt mostly on timber company lands, 10,000 to 20,000 acres or more. I've been on both sides and both are different, but both are good groups.

"We build our radio collars in-house. Most of them put out about 20 milliwatts in the 215-225 MHz range, giving 60-millisecond pulses every second or so. We typically cater to foxhunters who have about 15 to 20 hounds in their pickup. All those would have active transmitters on them. They would be trying to track or triangulate hounds that are out, say a mile or so from them. Our receiver allows them to space those transmitters out frequencywise. There's very little interference among them.

"For some customers, we add a 'tree switch' to the collar. Hounds that bear hunters use will bay the bear up into a tree. When the hound raises up on its front feet onto that tree and tilts his head back, a mercury switch kicks a resistor in parallel with another on the timing circuit and it makes the transmitter pulse at a faster rate. This lets the hunter know that the hound has trapped a bear and they need to get there quickly.

"Some hunters in Utah and Idaho use earphones because they're dealing with really weak signals and long distances in mountainous terrain. Most of the time they're in contact with their hounds, but occasionally one will get out and they won't be able to locate it. Then they'll use their radiolocation equipment to get in touch. Occasionally, a hound will slip out of its radio collar and you have to go find it.

"For them, especially, we do everything possible to get the sensitivity up. We use high-gain low-noise preamps on the receivers. Hunters in mountainous terrain use a 5-element beam to get the most signal. It's not unusual to get 12- to 15-mile range.

"Our product reliability is very important. Since hounds are a major investment, those guys want to keep them. For instance, bear hounds cost \$5,000 to \$10,000. It takes a few years to train one and you usually only get one really good one out of fifty or so."

To achieve the highest reliability, Magnum's collars are hermetically sealed to prevent corrosion. "It's not unusual for them to be under water for significant periods of time in the field," Gary says. Transmitter batteries are soldered in, not replaceable by the user. When they run down (which takes 3,000 to 16,000 hours, depending on the collar), Magnum refurbishes the unit. A magnetic switch inside each collar allows the user to turn it off by putting a bar magnet

"I think what really spurred on the use of radiolocation in hunting is that true wildlands are disappearing," adds Gary. "There's very few places where we can hunt 30,000 acres or so without encroaching. Radiolocation helps you control your hounds and it shows ownership and responsibility."

RDF is a boon to hunters because it helps them train their hounds, protect their investment and enjoy their hunts. It also has benefits for nonhunters. According to Gary, "A big reason these guys use RDF equipment is the responsibility side of it. They don't want to impose on people that aren't familiar with their sport. They are hunters, but they care about wildlife. I know they would help out your burrowing owl researchers in a heartbeat if they could. It's a great group of people, rooted in traditional values."

If they could see foxhunting nowadays, I wonder what George Washington and Thomas Jefferson would say.

"RF Bug" put to the test

At last year's Hamcon transmitter hunt (See "Homing In" for January/February 2000), one of the twenty hidden Ts was inside my conspicuous van, which was parked near the starting table. It should have been easy to track down, right? Not necessarily, because the hunters had to figure out which one of ten labeled antennas on the van was radiating the signal!

For some, this was a big problem. But as one hunter approached, he pulled out a small device, the size of a short stack of coins. It was the smallest RF "sniffer" that I had ever seen. I discovered later that it's also the least expensive.

Field strength meters (FSMs) have been around for decades. You can find construction plans for early versions in ARRL Handbooks



Photo B. The KC1 is the size of a stack of six nickels, with a cord for attaching it if desired.

of the 1950s. Hams used them to eke out the maximum amount of RF from their antenna systems. They placed them several wavelengths away and tuned their antenna coupling circuits for maximum meter indication. Sometimes FSMs with tube amplifiers

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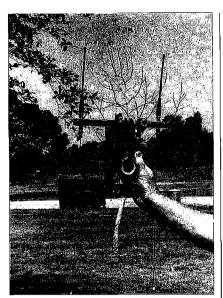


Photo C. Dan Welch W6DFW mounted a KC1 to his dual-antenna sniffer for a recent transmitter hunt in Fountain Valley, CA. Look closely to see it on the horizontal boom.

were included in vehicular installations, to help operators get the highest efficiency from their high-Q mobile antennas for the HF bands.

In recent years, FSMs have found a new market — bug sweeping. Believe it or not, there are plenty of people who think that there are tiny transmitting devices all over their homes and offices, ready to capture and send their most intimate conversations to

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earphone-wearing agents in trench coats sitting nearby in dark vans. Simple FSMs costing a few dollars to build are easy to sell to these folks, sometimes for hundreds of bucks each.

Was it this market that prompted NCG Company to introduce the KCI-R and KCI-B "RF Bugs?" (See Photo A.) Distributed in the USA by dealers of Comet antennas, these little devices "find hidden transmitters and ensure privacy," or so it says on the package.

The KC1-R and KCI-B (the only difference is color of the case) weigh only a quarter of an ounce each. Inside the almost-clear plastic case are a coin-cell battery and a circuit board with six light-emitting diodes (LEDs) and other surface-mount components. The two-inch antenna is curled inside the case (**Photo B**).

The obvious question from prospective purchasers of the KC1 is: "What's the range at which it activates?" The answer isn't simple. The antenna is curled up in almost a full circle and there is no counterpoise except for the tiny circuit board. So sensitivity depends on orientation and where it is (hand, pocket, etc.). It also is a function of the transmitter's power, frequency, and modulation. In my tests, I usually held it in my hand at arm's length from my body.

NCG claims that the KC1 activates within 12 inches of PCS phones and 40 inches of 800 MHz cell phones. In my tests, it didn't light until I got to 15 inches from a 800 MHz 1.2-watt analog mobile phone. Hand-held 800 MHz phones run only 600 milliwatts, so detection distance with them should be even less.

Other portable phones gave less detection range: Two inches from 900 MHz spread-spectrum handset or its base, one inch from a 49 MHz cordless handset, and a quarter-inch from its base whip. On the other hand, the first two microwave ovens that I tested set off the KC1 at one foot from the door.

What about two meters?

No claims are made on the package about performance on ham bands. With its very short antenna, sensitivity on frequencies below 500 MHz ought to be much less than at UHF and microwaves. Detection distance for a typical 146.565 MHz ammunition-can half-watt hidden transmitter with quarter-wavelength whip antenna turned out to be 4 inches from base of the antenna and closer at the antenna tip. It was the same for a typical two-meter handie-talkie.

A 25-watt 146 or 225 MHz mobile rig on a 5/8-wavelength antenna would activate it at six to eight feet from the antenna. It

should be possible to open the case and attach an external antenna to the board for greater sensitivity on HF and VHF, but I haven't tried that yet.

The KC1 has no sensitivity control. On most FSMs, you can dial back the sensitivity to readily determine which antenna in a closely spaced group is radiating. You can't do that on high-power transmitters with the KC1 unless you wrap it in foil.

What about finding those secret listening devices? They have very low RF power output to keep the battery size as small as possible. My guess is that you'll spend a lot of time sweeping with the KC1 before you find one. An Audio Technica wireless microphone on 170 MHz wouldn't activate it until I put it within one inch of the rear of the case.

One transmitter hunting task for which the KC1 is well suited is proximity warning. Many dual-antenna RDF add-on units such as the Vector-Finder by Radio Engineers and the Foxhound by Ramsey Electronics give left-right and front-rear indications only, with no attention paid to signal strength. Using these units, it's easy to walk over or past a buried or otherwise well-concealed transmitter. By including a KC1 in the system as the hunter in **Photo C** did, you'll know you're very close when the lights start flashing.

The KCl really isn't an FSM, because there is no meter. The LEDs aren't a bar graph, they just flash in sequence. That makes it difficult to use as a tune-up aid. The LEDs continue to flash for ten seconds after the RF goes away. This improves detection of pulsed signals such as digital phones, but it detracts even more from its usefulness as a measurement tool. Hey NCG, how about a ham model with a bar graph and without the long delay?

There is no ON/OFF switch. When you remove the plastic strip to connect the CR2032 battery and activate the unit, it draws about 4 microamperes in standby. Don't worry too much about draining the battery, as it should last about 6 years that way. When the LEDs are flashing, it draws an average of about 13.5 milliamperes, so one battery should be good for over 5000 ten-second activations.

Bottom line: Despite its high "cuteness" factor, the KC1 is just a crude RF indicator, not a calibrated test instrument. For 15 bucks, it's worthwhile for doing quick checks of transmitters and antennas, and to verify if the antenna you just spotted is that of the hidden T or just a decoy. But serious foxhunters will also want to have a better FSM with sensitivity control and external antenna provisions in their RDF arsenals.

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Time on My Hands

And things to do with it — like write articles.

Having been retired at the tender age of 55 for medical reasons, I found myself with a considerable amount of time on my hands and looking for ways to occupy myself without driving the XYL totally berserk. As a long-time but inactive ham, I decided to get active on the air — not just VHF, but HF as well.

n issue of 73 suggested sources for used equipment **L**and auctions, and I rapidly made contact with an interesting chap in Florida who just so happened to have an Icom 740 for sale at a price that fell into my budget. Not wanting to make a long story even longer, the equipment and my check changed hands, the addition of a GAP Titan antenna, some coax, and I found myself on the air and loving every moment except for the fact that I wanted a watch that would indicate both local and GMT times and have separate calendar dates for each zone.

Looking back to my misspent youth. I recalled the lovely RolexTM GMT Master which sat proudly on my wrist, throughout my tours of duty in SE Asia, while working for the US government. A quick Internet search revealed that a replacement for said watch would cost about \$3,000 more or less, and the XYL was adamant about not spending that much on a watch. The same day, nursing my wounds (fry pan applied to side of head at close range), I happened upon a display for TimexTM watches, and noted that a considerable number of them featured dual and even three independent time zone displays. This seemed like something to look into further, so I examined several and discovered that the Expedition model watches had both dual time zones and independent calendar date displays, and they sold for less than \$30 at my local mass merchandiser and discount store.

We acquired one and determined that we could set the basic or default time to read local EST with its applicable date, and the second time zone could not only be set for GMT, but with the corresponding date and 24 hour format as well. A press of the mode switch selected the second time zone, which remained displayed until you elected to switch to one of the other many features. This watch, costing a fraction of the amount I would have liked to spend on a Rolex, has served me well during periods of communications when I want to know the UTC, GMT, or Zulu time for logging, QSL cards, etc. The watch is rugged, accurate, and above all cheap, and has made my ham activities just a bit more fun - except that I do dearly miss that Rolex, it had real snob appeal. So if you are looking for a watch for Field Day, DXpeditions, or just to impress your JAG fans, you can't go wrong with any of the Timex Expedition series digital watches. Just make sure that the model you select has independent date function.

Power and the loss thereof

For perhaps only the second time in the past two hundred years or so, the South, and specifically the home QTH area of Smyrna (a suburb of Atlanta. Georgia) has had an incident referred to as the "recent unpleasantness." The first such reference, I am told, referred to the illegal occupation of the South by the North during what was called the Civil War. The week started out just fine - in fact, we had record high temperatures — and then it happened: A combination of severe cold weather and the grandpappy of all ice storms left some 400,000 of us without electricity, heat, and every creature comfort that comes with it.

The home QTH was a pleasantly balmy 40 degrees (inside) (outside with the wind chill it was around 10 degrees), and for the next four days it was more of the same. Trees which had graced our modest home, Tara, 73 Amateur Radio Today • August 2000 57

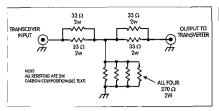


Fig. 1. Attenuator circuit.

were covered with ice, and the combined weight of the ice, plus high winds, caused them to come crashing down on the house, my daughter's car, and generally making life even more miserable. Lucky for us, we found a motel which would accept the family retainer, a well behaved Lhasa Apso, and we sweated out the balance of the storm in relative comfort considering the only open restaurants asked if you wanted it "super-sized."

Once things had returned to normal, and the family to Tara, I set out to ensure that the ham rig would at least be operational no matter what. Being physically challenged (that's politically correct for handicapped), I have the advantage of using an electric-powered chair to get around in. The chair obviously runs on batteries, and batteries have to be replaced on a periodic basis. In fact, they recommend replacing the two healthy-size sealed 12 volt gel cells on an annual basis, regardless of their condition. Having just replaced mine before the storm, I looked at the two "old" batteries and learned that they were capable of delivering 33 Ah (amp-hours) each. Hmmm, if I connected them in parallel, that would mean I'd have something in the neighborhood of 60 Ah to supply power to whatever rig I wanted to use. A quick bit of wiring, positive to positive, negative to negative, placed them in parallel (they were series connected for 24 volts in the chair) and overnight on the conventional automotive battery charger resulted in a ready-to-use, relatively high-capacity emergency source of DC power.

OK, so you aren't lucky enough to be physically challenged. You just might, on the other hand, be able to get your hands on two or more of these batteries by letting your fingers or keyboard (assuming computer literacy) do the walking in the local Yellow Pages 58 73 Amateur Radio Today • August 2000

directory under medical equipment. What you are looking for is a dealer who services and perhaps sells electric mobility aids, commonly referred to as "scooters," or powered chairs. A phone call, followed up by a visit, just might result in you carting away some of the old batteries or at worst paying a few dollars for them. These batteries, as I mentioned, are quite heavy-duty — the 33 Ah rating is not unusual — and quite frankly, the two I have, even after a full year's use and recharging, are still quite viable.

If, on the other hand, you don't like walking through the Yellow Pages, or for that matter calling people up, the same batteries are available, along with literally thousands of others, from a company called BATTERIES PLUS™, a national chain of stores selling every type of battery you can imagine, and probably a dozen or so more that you've never even considered. They have a Web site: [www.Batteriesplus. coml, and a toll-free number, 1 (800) 67START, if you need more information. By the way, the batteries for my chair sell new for about \$45 each, so even if you can't get a used pair, the new ones aren't all that expensive.

How to peacefully coexist with your transverter

As I was setting up my station, I'd heard that six meters was getting quite hot, and rather than buying a single rig for six-FM, one of my friends at the repeater association suggested the Ten-Tec 6 Meter Transverter. Naturally, I ordered one, but I did take advantage of their used and demo listing to buy a factory-wired unit (demo) that was ready to go and carried a warranty same as new. There was one catch: The input from the transceiver could not be more than 5 W, and as far as I could tell, the Icom 740, even with the RF cranked all the way down, could put out more than was safe to use.

Obviously, some sort of attenuator circuit was necessary. The transverter specifications showed that the input at 5 W would result in about 10 W out on six, which was exactly what I wanted, at least for now. I could have gone into the rig, and, using the chart supplied in

the Ten-Tec manual, changed a single resistor value and been "good to go" just as long as my RF input did not exceed 10 W. The manual cautioned that you would not be able to operate in prolonged key-down situations such as FM. Well, considering the fact that I could not accurately verify the output, even with the RF turned all the way down, the circuit shown in Fig. 1 was born.

There's nothing overly complex about it. You need a total of eight resistors, four 33 ohm and four 270 ohm 2 watt composition resistors. So, I lied: There is a bit of a problem. Last time I looked at my local Radio Shack, the resistor assortments stopped at 1 watt, and I had to search high and low, without success, for a local source of what used to be a fairly common value and wattage. Nothing stops a reader of 73, and a small ad from RF Parts Company and a minimum order (I think it was \$25) brought these now nearly extinct components to my door. RF Parts has a Web site [www.rfparts.com], and a toll-free number 1 (800) RF-PARTS for, for the alphabetically challenged, 1 (800) 737-2787]. We mounted the resistors on a couple of terminal strips (you do know what a terminal strip is?) and used two SO-239 coax connectors for Transceiver RF in, and Output to Transverter. The circuit, mounted in a small minibox, provided us with a margin of safety and several happy days of contacts on six meters, all modes. Try one yourself - it's a natural if you aren't sure how low your rig can go. While you're at it, tell the folks at RF Parts you read about them in 73.

Computers: Every article has to mention them

There seems to be an unwritten rule that every, or almost every, ham or technical article has to mention or refer to computers. Not willing to break the rule, we will mention computers. Hams and computers go together like white on rice, unless, you are health conscious, and then it's brown on rice. We are bombarded with ads for them on TV, in the newspapers and magazines, and everyone wants one. So as a ham, you are no exception, except that you

are a bit smarter. You know that last year's technology or, for that matter, technology that's two or even three years old is more than adequate for logging, rig controlling, PSK31, and packet operations. You are the last person who will spend too much for a computer — or are you?

Hamfests are great places to meet people, buy a boat anchor or two, even pick up some small parts or antenna cable, but they are the last place I'd go to buy a computer. Granted you might see a bargain, but can you really evaluate this bargain, will it work when you get it home, does it even work now? Think about it, and let me tell you about another source, not unlike the gel cell batteries, that can save you some real money while getting a good value for whatever money you do have available.

Given that technology changes at a rate almost equal to the current increases in gasoline prices, and that companies big and small are afraid to be left behind the "technology curve," whatever that is, there are hundreds of computers being declared excess and or surplus by these companies rushing to buy the very newest, fastest, and "best." Then, you might ask, where do these old computers go? Excellent question. Large and small companies contract with other companies such as Technology Renaissance [www.ovinet. com] to purchase their old systems, refurbish them, and resell them to others. The technology can be as "young" as last year's laptop, or as old as a two- or three-year-old desktop. Regardless of the age, the seller considers them old hat, obsolete, not enough bells and whistles to meet today's needs, and you can benefit.

I first came across these resellers when I wanted a laptop for use when I spent a prolonged stay in the hospital. What I wanted was something to surf the Web, and not a great deal more. It had to be small, and relatively powerful, and it had to be CHEAP! My first laptop was an AT&T 486 DX-100, with 40 MB RAM, 750 MB hard drive, Active Matrix Color Display, and 28.8 modem, and came with a carrying case and the business card of the previous owner, an AT&T salesperson. As I

recall, the whole package cost me less than \$450 with a one-year warranty. It did the job for me - perhaps the salesperson needed something faster, a Pentium or better, but for my purposes. it was a great deal. I used it for over a year, and then made the mistake of lending it to Number One Daughter to use at college. Within a month, a computer that probably had bounced around in a car trunk for a few years. spent more than a few days in hospital. was dead — beyond resuscitation. Imagine how I'd have felt if it was a new \$2000+ system. I cried a bit and called their local number and found I could now get a Pentium. Compag 5400 Lite with CD-ROM, 2.3 GB hard drive, 32 MB RAM, color display, 56K modem, and a year's warranty (but no case) for less than \$600.1 jumped at it, bought my own case, and am presently wiring up the interface for PSK31 and looking for a good logging program (any suggestions, please E-mail). When I picked my system up, H-P Vectra desktops (Pentium) were selling for as little as \$125 (less the monitor).

Your best bet in finding a company like I did would be to call around. They might be listed in your phone book as Computer Resellers, or you might call the IS (Information Systems) people at any large company in your area. They should be able to steer you in the direction of whoever buys their old systems.

It's a wrap

One thing's for sure: You can have time on your hands and make the most of it, or you can just watch it go by [or "go buy," as the author Freudianly had it originally — ed.].

Remember, if you contact any of the companies listed in this article, be sure to tell them you read about them in 73 Amateur Radio Today!

NEUER SAY DIE

continued from page 4

someone to Korea to find out how they're able to run circles around us with schools that cost one third of ours to run.

We don't have to do that. There are

several books I've reviewed in my editorials and are also reviewed in my Secret Guide to Wisdom, which tell about American schools which are graduating outstanding kids at a fraction of our public school costs. But as long as you keep reelecting your crook to Congress, the NEA's millions of dollars in reelection campaign donations are going to cost you and your children billions and put American businesses at a competitive disadvantage with other countries.

Some Nerve!

Now that I understand that serendipity is often more than just chance. I enjoy it all the more when it happens. Like today.

It started this morning with a phone call from a reader in Last Vegas who wondered if I'd heard about using an automotive circuit tracer buzzer on warts and stings. Well, no. but I did know that Amazonian Indians used a wire from the spark plug of their boat motor to neutralize snake bites, and that some people in Australia cured a deadly virus by getting zapped with an electric fence. The Jungle Flying Doctors take along a little hand generator for snake and other poisonous bites. The serendipity came in when I was filing things that had piled up around my office and I came to a booklet on the ElectrIcare nerve stimulating unit from Nikken, the magnet company. It seems to be similar to those little crystal-powered gadgets, but run by batteries.

Today's doctor's concentration on pills and shots, and the blind eye medical research has turned on alternatives such as acupuncture, magnets, electricity, and even the psychological component of illnesses, is a shame on the medical establishment, and one whale of an opportunity for independent researchers to show them up.

Atomic Physics?

There's a lot of wool pulling going on, what with the zoo of particles physicists have discovered once they blew atoms apart. But, for all the billions of dollars put into scientist welfare (called research), current theory doesn't explain such basic stuff as gravitational, magnetic, or electric fields. Or why we have inertia. Or how photons and radio waves travel through space and act like both particles and waves. Quantum theory? We see it in the lab, but scientists have no good explanation for it. Current theory doesn't tell us about the structure of electrons, protons. or neutrons. It doesn't tell us what energy or electricity is. Or how matter can be turned into energy and vice versa.

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The Doldrums

The BEST days for propagation are likely to be August 7–10 and 27–31, while the POOREST days are expected to be August 15–24. The remaining days should be Fair (F) or trending between propagation conditions as shown on the calendar.

The usual summertime doldrums will also prevail on the HF bands this month, accompanied by signal fading and generally weak strengths between about 10 a.m. and 2 p.m. local time in your area. Morning and afternoon short skip and DX signal strengths will be generally better than at other times during the day, and on the BEST days, the 15, 17, and 20 meter bands may be open long after local dark.

So far, Sunspot Cycle 23 has produced disappointingly low solar flux values (200-

250) well below the peaks of previous cycles (300–350). During May, the solar flux dropped to 135 or so for several days. The number of magnetic field disturbances caused by solar disk events appear to be reaching a maximum as this is being written, an indication that cycle 23 may be close to its peak. If correct, we can expect a slow decline in HF propagation beginning about 2001 and lasting over the next five years to a low during 2005 or 2006.

One interesting phenomenon I have noticed

during the past year or so is that the actual band "conditions" frequently DO NOT seem to correlate with the solar flux values or the Boulder A and Boulder K indices broadcast by WWV at 18 minutes after each hour.

Band-by-band
summary

10 and 12 meters

Good daytime DX

on transequatorial paths to North and South America, Africa, and the Pacific, is expected on (G)ood days, with signals peaking in strength during the local afternoon. Plenty of short skip to 1,500 miles or more should occur on (G)ood days.

15 and 17 meters

Good daytime DX to many parts of the world, with maximum signal strength occurring during the late afternoon hours. These bands usually close after dark. Daytime short skip is expected to 2,300 miles and beyond on (G)ood days.

20 meters

Good DX conditions both day and night, with best signal strengths occurring after sunrise and again in the late afternoon and evening hours. You can also expect to hear strong signals in the west, northwest, and Pacific areas during hours of darkness. Daytime short skip beyond 2.000 miles is anticipated on most days.

30 and 40 meters

Good DX to most parts of the world from our location is likely during night-time hours, beginning at sunset and extending

		EA	STE	RN U	NITE	D ST	ATES	TO:				
GMT:	0.0	02	04	06	08	10	12	14	16	16	50	22
ALASKA							17/20	15/17	15/17			
AUSTRALIA	12/15	12/15			12/15	20/40	12/15	20				
CENTRAL AM.	15/17	15/17	15/17	40	40		20	20			10/12	10/12
EUROPE		30/40	30/40					12/15	12/15	20/15	12/15	12/15
FAR EAST						20	15/17	20				
HAWAII	12/15	12/15	20/17	20/17	20/17		20					
INDIA	20				20	20						15/20
MID-EAST	20	20/40	20/40							12/15	12/15	12/15
FIUSSIA/C.I.S.	17/20	17/20	17/20									17/20
S.E. ASIA	15/17	17/20										
SOUTH AFRICA	T	40/30		17/20				12/15	12/15			
SOUTH AM.	- 5	15	20	20							10/12	10/12
WEST COAST	15/17	20	20	30/40	30/40	30/40	30/40		10/12	10/12		15/17
		CE	NTR	AL U	NITE	D ST	ATES	TO:				
ALASKA	15/17	17/20	17:20			33/40	17/20	17/20				
AUSTRALIA	15/17	15/17	17/20	17/20	20	i	20	20				
CENTRAL AM	15/17	17/20	17/20	17/20	17/20		17/20	17/20	15/17	10/12	10:12	10/12

ALASKA	15/17	17/20	17:20			30/40	17/20	17/20				
AUSTRALIA	15/17	15/17	17/20	17/20	20		20	20				
CENTRAL AM.	15/17	17/20	17/20	17/20	17/20		17/20	17/20	15/17	10/72	10/12	10/12
EUROPE	17/20	17/20	17/20									17/20
FAR EAST	15/17	17/20	17/20			30/40	17/20	17/20				
HAWAII	15/17	15/17	15/17	20	20/30	30/40		17/20				
INDIA	15/17	20					20					15/17
MID-EAST	17/20	17/20	20									
FIUSSIA/C.I.S.	17/20	17/20	17/20	17/20						12/15	12/15	
S.E. ASIA	15/17		20	20				20		1		15/17
SOUTH AFRICA				20				$\overline{}$	15/17	20	20	
SOUTH AM.	10/12	15/17	30/40	30/40	\Box						10/12	10/12

SOUTH AM.	10/12	15/17	30/40	30/40							10/12	10/12
		W	ESTE	RN U	NITE	D ST	ATES	то	:			
ALASKA	10/12	15/17		20	20	30/40		20	$\overline{}$	I		15/17
AUSTRALIA	10/12	15/17	15/17	20	20	20/30	30/40					
CENTRAL AM	15/17	15/17	20/30	20/30	20/30	30/40				10/12	15/17	10/12
EUROPE	20		\Box				20		15/17	15/17	20	20
FAR EAST	10/12	15/17		20	20	30 40		20	1			15/17
HAWAII	10/12	17/20	20	30 40	30/40	30/40	20	20		15/17	15/17	15/17
INDIA	15/17							20	15/17	i		
MID-EAST	20	20							15/17	i –	20	
RUSSIA/C.I.S.	20	20	20	20			1		†			20
S.E. ASIA	10/12							20	15/17	15/17		
SOUTH AFRICA			20	20		T			15/17			
SOUTH AM.	15/17	15/17	15/17	20	20	20/30		_	ĺ			10/12
EAST COAST	10/12	10/12	15/17	20/30	30/40			20	10/12	10/12	20	20

August 2000									
SUN	MON	TUE	WED	THU	FRI	SAT			
		1 F	2 F	3 F	4 F	5 F			
6 F-G	7 G	8 G	9 G	10 G-F	11 F	12 F-P			
13 P-F	14 F	15 F-P	16 P	17 P	18 P	19 P			
20 P-VP	21 VP-P	22 P	23 P	24 P-F	25 F	26 F-G			
27 G	28 G	29 G	30 G	31 G					

after sunrise. High static levels due to occasional thunderstorms along the path of propagation may be expected. Short skip between 500 and 1,000 miles can be expected on most days.

80 and 160 meters

Some weak DX openings may occur during darkness hours and around sunrise, but will often be masked by high noise levels due to thunderstorm static. Night-time skip between 200 and 2,000 miles may be expected, but daytime skip will be limited to about 200 miles. 73, W1XU/7.

ON THE GO

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communicator. There are a hundred things that cannot be done at the last minute. The time to get these done is when they are the farthest things from your mind.

- 4. Participate in local network activities. There are many opportunities weekly training nets, traffic nets, and SkyWarn. There is a discipline that is required for a net to operate efficiently and effectively. If you are a regular participant, this discipline becomes almost a rhythm in your operating technique. During a real emergency it is evident who is used to operating in a directed net and who isn't. As the punch line to the old joke goes, "... practice, practice, practice!"
- 5. Involve others. In the event of a real emergency you'll need every operator you can get. Invite others to participate. If you hear a new callsign on the local repeater, invite them to a club meeting or a net.
- 6. Be open to suggestions. Every one of us can do things just a little better. Ham radio by its very nature is a dynamic hobby so it is always changing. Listen to other's ideas and be willing to try them. Keeping people interested and involved is easier when they feel they are being listened to.
- 7. Be a mentor. When you hear that freshly minted call or an interim upgrade call, lend a helping hand. Compliment good operating practices. Offer advice not criticism. Make people feel like they're glad they moved into your neighborhood. And, please, PLEASE don't assume the title of frequency police. Be there to help not dictate.
- 8. Stay involved. With a hobby as diverse as ours, it sometimes takes a turn in an unexpected direction and some people vote with their feet. If you're as good as you think, we need you to stay active in the hobby.

So before the ink dries on that new license or upgrade, take a look at what you can do to help out. This is a very special hobby, with special requirements and special responsibilities. But that's okay, because it attracts a pretty special group of people.

ORP

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select the L27/C77-C78 combination for the final transistor.

What happened is kind of simple once you look at it. With D7 shorted, no matter what band you selected you always had several other stages turned on as well. That's way the heterodyne oscillator did not work. When 80 meters was selected, the 20-meter crystal was still selected as well. That's why the heterodyne oscillator did not run. Two crystals were in parallel!

The fix is simple. Replace D7. After the new diode was in place, the 12 volt switching voltage was only present when 20 meters was selected by the push-button.

The only other fixes were to the L18/L19 coil and the trimmer capacitors. The trimmers were kind of easy to fix. The screw size is 5-56 by 1/4-inch-long. Radio Shack sells a pack for about two bucks. But, the heads of these screws are too small to hold the top half of the trimmer together. The fix? I used nylon shoulder washers. These are the same kind you would find in a TO-220 mounting kit. The shoulder part of the nylon goes the trimmer first. Then the screw is dropped down in the trimmer. The trimmer has the same thread size, so all you need to do is tighten the screw! Don't over do it, as you can easily run the screw head through the nylon washer.

The L18/L19 slug was a bit trickier. Before recycling became fashionable, Heathkit was already into it. Many of the same components are used in a variety of Heath products. Case in point is the heterodyne crystals used in the HW-8. They are the same as in the Heathkit HW-101! So, to replace the broken slug in the L18/L19 coil, a slug was removed from the heterodyne oscillator coil from a dead HW-101. Worked like a champ!

Setting the VFO

There's one scheme that Heathkit used in almost all of their analog VFO designs: You had to balance the ends of the VFO to calibrate it. Here's how Heath wanted you do to it:

You used a receiver to listen to the output of the VFO. You then turned the receiver to the low end of the VFO. You adjusted the

VFO trimmer so you could hear its signal. Then you reset the receiver to the high end of the VFO's output and adjusted the VFO's coil so you could hear the signal. You did this over and over again until the two ends were balanced. What you ended up with is a VFO that tracked from the high end to the low end. Now, if you have ever tried this using the method described above, you'll go batty!

Here's an easier and quicker method. You'll need a good frequency counter. Allow both the HW-8 and your counter to warm up for at least 30 minutes.

Couple your counter to test point two. This is resistor R49. Go to the end of the resistor that is closest to L9, the large VFO coil. The VFO in the HW-8 runs from 8.895 MHz to 8.645 MHz. The idea is to set the VFO so it will track from one end to the other between the two frequencies of 8.8895 and 8.645 MHz. You adjust the trimmer located on the VFO tuning capacitor (C302B) and the slug in L9. Again, the idea is to set the trimmer and slug so the VFO will run from 8.8895 to 8.645 MHz. It's not easy to set, so do the best you can. I find that the trimmer on the VFO tuning capacitor is very touchy!

After a few hours, my Hamvention 2000 HW-8 was working like new.

Some closing thoughts about the HW-8. Although the manual calls for 3.5 watts of RF into a 50-ohm load, I've found these values to be much closer to real life:

Transmit power @ 13.8 volts into 50-ohm load: 80 meters 1.5 watts, 40 meters 1.5 watts, 20 meters 1.5 watts, 15 meters 1.2 watts.

Of course, I've seen more power in some HW-8s on 80 meters than 1.5 watts, but the values shown are very typical.

On receive: 80 meters 0.5 μ V, 40 meters 0.6 μ V, 20 meters 0.7 μ V, 15 meters 0.7 μ V.

Of course, your HW-8 may have a much hotter front end, but again, these values are typical. In other words, your mileage may vary!

If you happen upon an HW-8 this summer at a hamfest, be sure you pick it up. Even though they are nearing 30 years old, they're still a very incredible radio.

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SEND FOR "HOW TO WRITE FOR 73"
Write to Joyce Sawtelle at
70 Hancock Rd., Peterborough, NH
03458

THE DIGITAL PORT

continued from page

almost convinced to go out and buy a new Colossa-Hz computer. Later ...

More ways to skin a cat

I read a message on one of the PSK-related reflectors recently that sparked a memory about a piece of equipment that works very well and doesn't often get its due. A ham was telling about the excellent luck he had with less than a watt on a DX RTTY contact with a ham who was running a kilowatt station.

As I read through this, I realized the DX station was using a superb receiving system for RTTY that will virtually drag signals out of the mud and decode them. The secret weapon was the Timewave DSP 599zx. For those of you who are not aware, Timewave built a modem into the 599zx that works along the order of the HamComm serial modem. The advantage lies in the superb DSP available from the 599zx that filters RTTY perfectly. I have one of these along with Timewave's DSP-RTTY software and it does work very well.

This made me stop and think what advantages we all have now with the sound-card software for digital modes including RTTY. One of the major advantages of using the soundcard is the built-in DSP. It takes some clever programming, but we have a number of clever programmers who have written software not only for RTTY but also for other modes.

That is one of the reasons PSK31 has caught on so well. It gives us near-perfect copy, digs signals out of the mud and affords relatively high-speed throughput. I don't know if Timewave was first at all this, but they certainly made a contribution.

Antenna noise canceled

Now I see Timewave has something new that may be of interest to a lot of us. When Japan Radio Corp. pulled out of the ham radio field, Timewave acquired the rights to build their line noise suppressing equipment. It looks like a good thing for any ham station experiencing RF noise associated with power lines, electrical equipment, etc. It intercepts the noise before it gets to the RF stage of the receiver. I took a look and it is on their Web site as listed in The Chart.

Another URL update

I received a message that George SV2AGW's Web site no longer responded. After a bit of searching, I found the same

free software that George has written, with many updates is at the new URL listed in The Chart. You will find free packet software for just about everything you could ask that works with Windows95, on TNCs, and on modems of the various speeds and he claims compatibility with all soundcards now. Another outstanding contributor to the ham fraternity.

If you have questions or comments about this column, E-mail me [jheller@sierra.net]. I will gladly share what I know or find a resource for you. For now, 73, Jack KB7NO.

NEVER SAY DIE

continued from page 59

In space, physicists need an ether medium for photons/electromagnetic waves to travel in, but they also say there is no ether. All particle/waves have to have a vector, but when they try to measure it, the particle/wave disappears.

A basic problem facing scientists is that the atomic world is so entirely different from the one we are familiar with that they keep trying to understand it in the wrong frame of reference. As Nobel Laureate Richard Feynman said, "The mechanical rules of 'inertia' and 'forces' are wrong — Newton's laws are wrong — in the world of atoms ... here things behave like nothing we know of, so that it is impossible to describe this behavior in any other than analytical ways."

A hundred years ago Bessant and Leadbeater, two Theosophists, using meditation as their microscope, outperformed any microscope we have yet invented with their description of atoms and their movement. They described all of the known elements, plus elements and isotopes which were still unknown at that time, right on down to quarks, subquarks and strings. You can read the details in the Stephen Phillips book reviewed on page 10 of my Secret Guide to Wisdom.

I suspect that, if scientists could get past their disbelief in the power of the mind, that they might be able to come to grips with quantum mechanics and start being able to understand more about physics fundamentals.

Heck, much of the physics establishment is still in denial over the transmutation of elements, needing bigger and bigger brooms to sweep the mounting evidence under their already bulging carpet.

Now What?

Since the ARRL has not announced

any plans to do anything as a result of the FCC's restructuring move to help kick-start the hobby, and the ham industry seems too disorganized and too near bankruptcy to do much, that leaves only the ham clubs.

Yes, I have a plan. I think you'll like it. Step one will be to get a CD-ROM of the *Callbook* so you can get a list of all the hams within easy driving distance of your club's meeting place and print it

Step two will be to split the list among your club members so they can call everyone. You want to find out if they're interested in upgrading under the new rules, and they can be offered a personal invitation to the next club meeting.

Step three: Add the names to your club newsletter mailing list of any hams who haven't slammed down the phone.

Step four: Organize license test groups to discuss the Q&As after each club meeting, and have your VECs there to give the tests.

Step five: Make darned sure your club meeting is fun. Have an interesting speaker — a ham dealer or manufacturer, or perhaps a local ham who's involved with ham satellites, packet, SSTV, or something else exciting, like showing off QRP rigs and the cards garnered with 'em. Have a report on how DX is doing on each of the ham bands. What's doing on 6m, and so on. A club meeting is show biz, so keep it lively and fun. Be sure to introduce any new faces, and publicly congratulate anyone who's upgraded.

Step six: After the meeting, you have a choice of helping to shorten your members' lives with coffee and doughnuts, or maybe having a big plate of veggies and dip. Yes, I know which you'll choose.

We've got close to 400,000 hams out there who need to be encouraged to upgrade to at least General. So we need to make sure they know about the DX that is rolling in night and day, and the fun we're having on the HF bands. It doesn't take a kW and a beam on 10m to work the world, just a dipole and 100 watts.

Let's get the DX warning nets going on 2m again so DXers won't miss contacting DXpeditions, and helping to make sure hams in rare countries wish they'd never heard of amateur radio.

Let's drive the ham industry crazy trying to keep up with the demand for new gear and antennas.

Oh, yes: By the way, I've been extremely disappointed that you haven't been sending letters to the editor to tell me how much fun you've been having with that new rig you bought — and what you've been able to do with it.

Continued on page 64

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Here are some of my books which can change your life (if you'll let 'em). If the idea of being healthy, wealthy and wise interests you, start reading. Yes, you can be all that, but only when you know the secrets which I've spent a lifetime uncover-

.....Wayne

The Bioelectrifier Handbook: This explains how to build or buy (\$155) a little electrical gadget that can help clean the blood of any virus, microbe, parasite, fungus or yeast. The process was discovered by scientists at the Albert Einstein College of Medicine. quickly patented, and hushed up. It's curing AIDS, hepatitis C, and a bunch of other serious illnesses. The circuit can be built for under \$20 from the instructions in the book. \$10 (#01)

The Secret Guide to Wisdom: This is a review of around a hundred books that will help you change your life. No, I don't sell these books. They're on a wide range of subjects and will help to make you a very interesting person. Wait'll you see some of the gems you've missed reading. \$5 (#02)

The Secret Guide to Wealth: Just as with health, you'll find that you have been brainwashed by "the system" into a pattern of life that will keep you from ever making much money and having the freedom to travel and do what you want. I explain how anyone can get a dream job with no college, no résumé, and even without any experience. I explain how you can get someone to happily pay you to learn what you need to know to start your own business. \$5 (#03)

The Secret Guide to Health: Yes, there really is a secret to regaining your health and adding 30 to 60 years of healthy living to your life. The answer is simple, but it means making some difficult lifestyle changes. Will you be skiing the slopes of Aspen with me when you're 90 or doddering around a nursing home? Or pushing up daisies? No. I'm not selling any health products. \$5 (#04)

My WWII Submarine Adventures: Yes, I spent from 1943-1945 on a submarine, right in the middle of the war with Japan. We almost got sunk several times, and twice I was in the right place at the right time to save the boat. What's it really like to be depth charged? And what's the daily life aboard a submarine like? How about the Amelia Earhart inside story?If you're near Mobile, please visit the Drum. \$5 (#10)

Wavne's Caribbean Adventures: My super budget travel stories - where I visit the hams and scuba dive most of the islands of the Caribbean. You'll love the special Liat fare which let me visit 11 countries in 21 days, diving all but one of the islands, Guadeloupe, where the hams kept me too busy with parties. \$5 (#12)

Cold Fusion Overview: This is both a brief history of cold fusion, which I predict will be one of the largest industries in the world in the 21st century, plus a simple explanation of how and why it works. This new field is going to generate a whole new bunch of billionaires, just as the personal computer industry did, \$5 (#20)

Cold Fusion Journal: They laughed when I predicted the PC industry growth in 1975. PCs are now the third largest industry in the world. The cold fusion ground floor is still wide open. but then that might mean giving up watching ball games, Sample: \$10 (#22). Julian Schwinger: A Nobel laureate's talk about cold fusion-confirming its validity. \$2 (#24)

Improving State Government: Here are 24 ways that state governments can cut expenses enormously, while providing far better service. I explain how any government bureau or department can be gotten to cut it's expenses by at least 50% in three years and do it cooperatively and enthusiastically. I explain how, by applying a new technology, the state can make it possible to provide all needed services without having to levy any taxes at all! Read the book, run for your legislature, and let's get busy making this country work like its founders wanted it to. Don't leave this for "someone else" to do. \$5

Mankind's Extinction Predictions: If any one of the experts who have written books predicting a soon-to-come catastrophe which will virtually wipe most of us out are right, we're in trouble. In this book I explain about the various disaster scenarios, like Nostradamus, who says the poles will soon shift (as they have several times in the past), wiping out 97% of mankind. Okay, so he's made a long string of past lucky guesses. The worst part of these predictions is the accuracy record of some of the experts. Will it be a pole shift, a new ice age, a massive solar flare, a comet or asteroid, a bioterrorist attack? I'm getting ready, how about you? \$5 (#31)

Moondoggle: After reading René's book, NASA Mooned America, I read everything I could find on our Moon landings. I watched the videos, looked carefully at the photos, read the astronaut's biographies, and talked with some of my readers who worked for NASA. This book cites 25 good reasons I believe the whole Apollo program had to have been faked. \$5 (#32)

Classical Music Guide: A list of 100 CDs which will provide you with an outstanding collection of the finest classical music ever written. This is what you need to help you reduce stress. Classical music also raises youngster's IQs, helps plants grow faster, and will make you healthier. Just wait'll you hear some of Gotschalk's fabulous music! \$5 (#33)

The Radar Coverup: Is police radar dangerous? Ross Adey K6UI, a world authority, confirms the dangers of radio and magnetic fields. \$3 (#34)

Three Gatto Talks: A prize-winning teacher explains what's wrong with American schools and why our kids are not being educated. Why are Swedish voungsters, who start school at 7 years of age, leaving our kids in the dust? Our kids are intentionally being dumbed down by our school system - the least effective and most expensive in the world, \$5 (#35)

Aspartame: a.k.a. NutraSweet, the stuff in diet drinks, etc., can cause all kinds of serious health problems. Multiple sclerosis, for one. Read all about it, two pamphlets for a buck. (#38)

One Hour CW: Using this sneaky booklet even you can learn the Morse Code in one hour and pass that dumb 5wpm HF entry test, \$5 (#40)

Code Tape (T5): This tape will teach you the letters, numbers and punctuation you need to know if you are going on to learn the code at 13 or 20 wpm, \$5 (#41) Code Tape (T13): Once you know the code for the letters (#41) you can go immediately to copying 13 wpm (using my system). This should only take a couple of days. \$5 (#42)

Code Tape (T20): Or, you can start right out at 20 wpm and master it in a weekend, \$5 (#43)

Wayne Un-Dayton Talk: This is a 90minute tape of the talk I'd have given at the Dayton, if invited, \$5 (#50)

Wayne Tampa Talk: This is the talk I gave at the Tampa Global Sciences conference-where I cover amateur radio, cold fusion, health, books you should read, and so on, \$5 (#51)

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Reprints of My Editorials from 73. Very few things in this world are as we've been taught, and as they appear. I blow the whistle on the scams around us, such as the health care, our school system,, our money, the drug war, a college education. sugar, the food giants, our unhealthy food, fluorides. EMFs, NutraSweet, etc.

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2000 Editorials: In the works.

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Wayne's Bell Saver Kit. The cable and instructions enabling you to inexpensively tape Art Bell W6OBB's nightly 5-hr radio talk show, \$5 (#83) NH Reform Party Keynote Speech. It wow'd 'em when I laid out plans for NH in 2020, with much better, yet lower cost schools, zero state taxes, far better health care, a more responsive state government, etc. \$1 (#85)

Stuff I didn't write, but you need: NASA Mooned America: René makes an air-tight case that NASA faked the Moon landings. This book will convince even you. \$25 (#90)

Last Skeptic of Science: This is René's book where he debunks a bunch of accepted scientific beliefs - such as the ice ages, the Earth being a magnet, the Moon causing the tides, and etc. \$25

Dark Moon: 568 pages of carefully researched proof that the Apollo Moon landings were a hoax-a capping blow for René's skeptics. \$35 (#92)

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Make your list, count the words, including your call, address and phone number. Include a check or your credit card number and expiration. If you're placing a commercial ad, include an additional phone number, separate from your ad.

This is a monthly magazine, not a daily newspaper, so figure a couple months before the action starts; then be prepared. If you get too many calls, you priced it low. If you don't get many calls, too high.

So get busy. Blow the dust off, check everything out, make sure it still works right and maybe you can help make a ham newcomer or retired old timer happy with that rig you're not using now. Or you might get busy on your computer and put together a list of small gear/parts to send to those interested?

Send your ads and payment to: 73 Magazine, Barter 'n' Buy, 70 Hancock Rd., Peterborough NH 03458 and get set for the phone calls. The deadline for the November 2000 classified ad section is September 10, 2000.

President Clinton probably doesn't have a copy of *Tormet's Electronics Bench Reference* but you should. Check it out at [www.ohio.net/~rtormet/index.htm]—over 100 pages of circuits, tables, RF design information, sources, etc. BNB530

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NEUFR SRY DIE

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If you've got an interesting ham shack or antenna system, get a decent camera and maybe you'll make the cover!

If you're having a ball with QRP, get your word processor going and let's see if we can get a few thousand more addicts involved.

QRPers have been working some remarkable DX these days. Heck, when I've operated from rare spots around the world I've always worked the frequency right down to the weakest signals I could hear before starting a new pileup, so I've helped a lot of QRPers get rare cards. And one of my first contacts with China, W7IMW/C7, was using a tenth-watt signal generator for a rig and a long wire on 20m.

Step 5A: If all else fails for an entertainer at a meeting you can always hook up a telephone to an amplifier and call me to give a talk.

To steal ideas from one person is plagiarism — to steal from many is research.

Amateur

Radio Today

Spreading the Ham Virus

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Up on a Down Under Kit — W4QBU The DSE K-7204 ESR/low ohms meter measures well on the 73 review-o-meter.

QRX...

Industry and ARRL Meet in Dallas

The second meeting of the ham industry with the ARRL took place at the Dallas Ham Com convention on Thursday evening, June 8th. We have this report:

If the ham industry meeting a few months ago in Milwaukee was a lovefest, then the meeting in Dallas on June 8th might best be characterized as a newlywed couple having their first spat. And while nobody is willing to talk on-the-record, the problem appears to be at the level of the retail dealers rather than higher up the ham radio distribution chain.

Simply, retailers are looking for two things. With business far from good, first and foremost they are looking for a way to eke out enough profit so as to pay the mortgage on their home, put food on the

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NEVER SAY DIE

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A Birthday Present

My 78th birthday is September third and I'm asking you for a birthday present. Stop cringing, it isn't going to cost you anything.

Few magazines last ten years, much less forty, so when I started 73 back in 1960, it never really dawned on me that I'd signed up for a lifetime job. Mind you, I'm not complaining. What better way to spend a life time than working in a field that's your major hobby - something you are personally interested in and enjoy? Indeed, this is just what I preach in my Secret Guide to Wealth. Build your career in a field that's fun for you instead of seeming like work. And what, for a dyed-inthe-wool ham, could possibly be more fun than publishing a ham magazine?

The first issue of 73 was the October issue, and came out in September 1960, 40 years ago.

Well, 1960 was quite a year for me. In 1959 I volunteered for a free trip around the world on "Operation World Wide," where Bill Leonard W2SKE and I had a fantastic time making 20m SSB contacts as we flew around the world in an old unpressurized Air Force C-54 (which had been used for the famed Berlin Airlift), visiting the hams in 23 countries.

At the time I was the editor of CQ, but I had my work done so far ahead that taking off for a couple of months wasn't any problem. Later that year the State Department asked me if I would represent amateur radio on the US team at the International Telecommunications Union conference in Geneva. That's a long and interesting story.

When I got back from these two trips and got busy contacting authors for articles for the magazine I began hearing from

very unhappy authors and columnists. They hadn't been paid in ages. So I went to the office one weekend to took a look at the books - and found that while I'd been away most of the magazine's money had been spent buying the publisher a luxury yacht, and that my authors and columnists hadn't been paid for almost a year. To keep things going I paid many of them out of my own pocket, with the publisher's and the bookkeeper's promises that I'd be repaid. When they got to where they owed me a full year's pay I was fired. That was in January 1960 — starting off the year in great shape.

No, I've never gotten a nickel of that money back from *CO*.

I tried working for an ad agency for a few months, but it wasn't any fun. What I really enjoyed was editing a ham magazine and helping to pioneer stuff like SSB, RTTY, and NBFM.

When CQ stopped publishing construction articles and went almost 100% to columns. I knew hams loved to build, so I decided to start 73 and push the fun of home building as hard as I could. Well, that was the change I made in CQ when I started as the editor in January 1955. And that formula took the magazine from losing about \$50,000 a month in today's dollarettes into the black within a few months. By 1959 it was making millions most of which went into the publisher's yacht. He made it a company "expense" by inviting the staff for a cruise one day a year.

I sold off most of my toys — my sea plane, my Porsche, my boat — and got together just barely enough money to print the first issue of the magazine. And it's still around!



1960 was a really busy year. I helped the ARRL's Hudson Division Convention sell booth space, founded and was the first secretary of American Mensa, was president of the Porsche Club and put on several rallies that no one who participated in will ever forget, and stuff like that.

What You Can Do

So here we are, forty years later. Here we are with over 677,000 licensed hams, 75% of which don't subscribe to any ham magazine. Now, that's a shame! I can understand the hams who entered the hobby through the no-code Tech ticket considering the League to be the enemy, and thus refusing to subscribe to QST. Hey, that's 57% of us right there! And I can understand where many hams might not be very interested in contests, and thus pass up CQ. Hmm, that leaves 73!

As a birthday present for me please get on the air and tell the Techs on the repeaters about 73. Then get on the HF bands and tell the new Generals what they're missing. If you can convince just one more subscriber, that will be a wonderful birthday present. The magazine will help make their hobby a lot more fun. They'll have a ball trying the antennas we publish, and my editorials will give them a lot more to talk about than the weather.

Six meters is hotter'n a pistol, with contacts all around Europe and even Australia.

I'll keep leaving the contest news to CQ, and the operating news to QST. I want to help every ham to have fun with our ham satellites, with the red hot HF bands during this sun spot

peak, and to try RTTY, SSTV. and packet. Maybe I can even get some of you to go on a DXpedition. I guarantee that you'll never forget one minute of such a trip for the rest of your life.

Amateur radio offers a lifetime of excitement and adventure, but only if you grab the opportunities. Like I have. And still do.

Oh, Canada!

Maybe you saw the TV exposé on seniors taking bus trips to Canada to buy their medications? The same drugs are available there at one half to one third their US prices, so it makes sense for people in our northern tier states to go to Canada every month or so and stock up on their medications.

All of which gives you a hint of how thoroughly the pharmaceutical companies are screwing us on drug prices. Why, they're almost making as much profit as the illegal drug sellers!

Of course, if I could get these people to read my health guide and change their life-styles a bit, they wouldn't have any need for prescription drugs. But since my discoveries would gut the whole medical industry, it isn't going to happen — at least not soon.

Did you read where American kids are now going to Canadian universities, where our kids are getting a higher quality education at a fraction of US university prices? How about \$7.200 at McGill University in Montreal?

A few years ago, when I was researching our university system, I had to visit Waterloo

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table, and send the kids through college. Some probably came to the Dallas conclave expecting to find some instant solution to their business worries, and were put off when nothing really new was offered.

The dealers also appear to have another problem, that of finding something in common with the rest of the ham radio industry. They see themselves as being on the frontline, having to battle for their very survival, while distributors, importers, magazines, and even the ARRL have some level of insulation from the problems that they have to face. Finding some common bond between the dealers and the rest of the industry will become a paramount issue in the months, years, and meetings to come.

This Dallas gathering also brought with it the realization that there is a big difference between the wants, needs, and desires of the ham radio retail community and the political arm of the hobby (as represented by the American Radio Relay League).

Several of those we spoke with say that the retailers were less than enthusiastic about having the League as a player. But at the upper levels in the ham radio supply chain it is understood that only by working together can all in ham radio — and this includes radio amateurs like you and me — hope to prosper. Also, that this prosperity will eventually reach the retail level if the dealers can show a bit more patience and wait for restructuring to take root. Once it does, ham radio should once again begin to grow, and everyone will benefit.

The Dallas meeting was hosted by Evelyn Garrison WS7A, 73 Ad Sales Manager, and Gordon West WB6NOA. These are two names well known inside and outside the ham radio industry. ARRL President Jim Haynie W5JBP, along with Rosalie White WA1STO and Jennifer Hagy N1DTY, represented the League.

Thanks to Newsline, Bill Pasternak WA6ITF, editor.

Restructuring: It Seems To Be Working

While it's too soon to know for sure, initial numbers on restructuring seem to bode well for ham radio.

After the first seven weeks following the implementation of changes in the United States Amateur Radio service, statistics compiled by Fred Maia of the *W5YI Report* are very encouraging. According to W5YI there are now 7,490 more General class license holders than there were on May 31st of 1999. This is most likely due to pre March 1987 Technician Class hams taking advantage of a no-test upgrade.

But the big surprise is the number of people

who have gone to Extra from the various other license classes. That number is up by an amazing 7.051: or a little over 9%.

Not surprising is the small amount of change in the area of code-free Technician class hams. They still remain the single largest group in ham radio at 206,854. That's 30% of all hams holding an FCC license. But from May 31, 1999, to May 31st of 2000 their ranks only grew by 1.873.

It's still too early to even conjecture as to whether or not this means the codeless entry into ham radio has lost its appeal. Some believe there will be another wave of code-free newcomers as soon as the initial changes brought about by restructuring begin to settle down.

While it is very early on in the streamlining process, the figures accumulated between the April 15th implementation of restructuring and the May 31st cutoff date of Fred's report do seem to show some small but perceptible positive change. If the trend continues, the year 2000 could be the beginning of a good growth period for amateur radio here in the USA.

Thanks to Bill Burnett KT4SB, via Newsline, Bill Pasternak WA6ITF, editor.

Ham Stats: The World of Amateur Radio

More good news about the number of people enjoying ham radio. The International Amateur Radio Union says that things appear to be looking up.

How many ham radio operators are there in the world? According to the International Amateur Radio Union Web site, the actual number of licensed radio amateurs reached just a few short of three million in 1999. That's right: We said three million, with Japan still leading the way with more than 1,296,000 station licenses issued. We in the United States rank number two at 679,864 individual license holders, followed by Thailand at 141,241, the Republic of Korea at 130,000, and Germany at 80,336.

And the good news continues. This as IARU figures show that the number of amateur license holders continues to grow. The IARU says that the number of amateur operators worldwide passed the half million mark back in 1969. That doubled in the ten years between 1970 and 1980, and again in the decade and a half between 1980 and 1995.

But there is a downside to all of this. According to the IARU, membership of national amateur societies shows a quite different trend. It says that most radio amateurs do not belong to their respective national societies and overall support of these groups continues to decline.

Thanks to David Black KB4KCH, via Newsline, Bill Pasternak WA6ITF.

Scientists Break Speed of Light

Has Star Trek come true? Can warp speeds be achieved? Warp speeds exceed the speed of light. Science now says it has happened.

Particle physicists have shown that light pulses can be accelerated to up to 300 times their normal velocity of 186,000 miles per second. And the implications, like the speed, are mind-boggling. (Actually, further explanation has speculated that some subatomic particles may have traveled at superlumina speed, but that the entire entities of which they might have been part might have remained sublumina — thus saving Einstein's as-pects. — ed.)

One interpretation: Light will arrive at its destination almost before it has started its journey. In effect, it is leaping forward in time.

Exact details of the findings remain confidential because they have been submitted to *Nature*, the international scientific journal, for review prior to possible publication. (Of course, the results may have been available before the experiments took place, in which case ... oh, never mind. — ed.)

The research is already causing controversy among physicists. What bothers them is that if light could travel forward in time it could carry information. This would breach one of the basic principles in physics — causality, which says that a cause must come before an effect.

It would also shatter Einstein's theory of relativity since it depends in part on the speed of light being unbreachable.

Thanks to Graham Kemp VK4BB, via Newsline, Bill Pasternak WA6ITF, editor.

Kids' Words of Wisdom

- Never trust a dog to watch your food. Patrick, age 10.
- When you want something expensive, ask your grandparents. Matthew, 12.
- Never smart off to a teacher whose eyes and ears are twitching. Andrew, 9.
 - · Wear a hat when feeding sea gulls. Rocky, 9.
- Sleep in your clothes so you'll be dressed in the morning. Stephanie, 8.
- Never try to hide a piece of broccoli in a glass of milk. Rosemary, 7.
- Don't flush the john when our dad's in the shower. Lamar, 10.
- Never ask for anything that costs more than five dollars when your parents are doing taxes. Carrol 9
 - · Never bug a pregnant mom. Nicholas, 11.
 - · Don't ever be too full for dessert. Kelly, 10.

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NEUER SAY DIE

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University (near Toronto) to find a university that was using personal computers productively.

At McGill the freshmen live on campus, but the upper classes mostly live in town. It's like that at Rensselaer, my alma mater, where they have a large freshmen dorm quadrangle and much smaller upper class dorms nearby for the geeks. The rest of the frosh are pledged to the fraternities. which have their fraternity houses all around town. There are the Greeks and the Geeks. My fraternity, Sigma Chi, bought the old governor's mansion in the posh section of town. I helped find the mansion when we decided to move from an old brownstone downtown near the railroad tracks to a more upscale area.

Okay, how come the same drugs are a fraction of US prices in Canada? How come Canadian universities are able to operate at a fraction of US universities? The drug situation

comes from the far more than cozy FDA-pharmaceutical-insurance company relationship. We're being screwed, my friends. Systematically fleeced by three big industries which have bought the power to screw us via their bribery of our congressmen. So we pay up or take a bus to Canada — or read my Secret Guide to Health.

If you want to know more about how far American universities have skidded in recent years, please read George Roche's The Fall of the Ivory Tower, which is reviewed in my Secret Guide to Wisdom (p. 9). Of course, if your youngsters or grandchildren have learned to read and to actually understand what they're reading, my \$5 Secret Guide to Wealth may save them from wasting four (or more years) and tens of thousands of your dough, going to college.

Music, Music

One thing we all enjoy is music. It's fun and relaxing. It's a great stress reducer.

It's also, for babies, a great

brain developer. It significantly increases their IQ, providing them with a brain boost which will benefit them all the rest of their lives. And this boost starts a lot earlier than you may think — during pregnancy. The downside of all this is that the kid will be a lot smarter than you, and always be one step ahead of you.

What kind of music should you play for little Ickey during his/her nine months of residency? In view of the research done with both plants and animals, where Mozart produced better growth for plants and more cooperation for animals, vs. stunted plant growth and animals that kill each other when exposed to rock music, I'd go for classical. Like Strauss (Johann Jr., rather than Richard), Joplin, Beethoven, Tchaikovsky's ballets, Mendelssohn. Yeah, Mozart is okay. His last four symphonies and Eine Kleine Nachtmusik, are good bets.

Right here in Peterborough we have Kindermusik classes for newborn babies to age 7, where they teach kids to play

instruments, and the older kids learn to read and compose music

Babies are like sponges in that the more things you expose them to, the faster and more powerful their brains grow. Putting them into play pens, shut off from exploring and learning, permanently limits their IQ development. There are no second chances when it comes to building baby's brain connections. With music, babies and youngsters are exposed to a new and fun bunch of things to learn.

It's the same with language. During the 1-3 year ages babies brains are in the language learning phase. Researchers have shown that babies can learn to speak dozens of languages at this age, and to be able to think in each of them without confusing them, and to speak them without any accent. This is a brain development skill that can never be done later on. This business of trying to teach foreign languages in high school goes against nature

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Richard Q. Marris G2BZQ 35 Kingswood House Farnham Road Slough SL2 1DA England

The Cap'n Crunch LOWFER Loop

This lightweight longwave antenna could become a classic.

Many readers may ask, "Why a special loop receiving antenna covering just 65 kHz in the LF spectrum, where there is nothing to hear anyway?" Well, there is a vast amount of activity in the band 130 kHz-195 kHz (2308-1538 meters). It is just 65 kHz wide, but looking at that in good old-fashioned meters, the segment is 770 meters wide!

hy "lightweight"? Well, most LF loops use a stout and heavy timber frame, plus a large amount of copper wire. The result is heavy. In this design, a lightweight cardboard frame is used, which is nearly weightless in itself. It is simple, cheap, and quick to construct. The one heavy item is a reel of copper wire 100 meters (333 feet) long.

What is there to be heard?

You might be amazed at the amount of activity to be heard between 130 kHz and 195 kHz, plus periodic spasms of atmospheric QRN — also

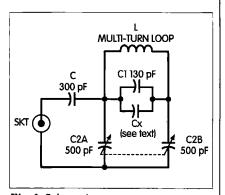


Fig. 1. Schematic.

- QRM. It is quite a different ball game than listening on the HF bands. The following is some of that activity:
- 1. The 136 kHz amateur radio band (135.5–137.8 kHz), which originated in Europe and is gradually spreading worldwide.
- 2. Between 130 kHz and 160 kHz, there are many largely unidentified strange-sounding repetitive signals, many of which are, no doubt, navigational aids. Some enthusiasts specialize in investigating and identifying these signals.
- 3. The USA-originated 1750 meter LOWFER band (160-190 kHz). LOWFER stands for Low Frequency Experimental Radio stations.
- 4. A bonus is some of the various European longwave high-power AM broadcast stations. It has been possible to list at least nine stations between 150 and 195 kHz, of which all but two share the same band as the USA-originated LOWFER band. These stations provide possible DX listening for the North American-based listeners, and others outside Europe. Conversely, it means that for European listeners, they swamp the very low power LOWFER stations in the USA and elsewhere.

Summarizing: Wherever you live on Planet Earth, there is always something heard between 130 kHz and 195 kHz.

A good receiver is required to get the best results, plus a sensitive loop antenna with excellent nulling to remove or greatly reduce the fiendish atmospheric noise and other QRN that often occurs. Also, believe it or not, you can often experience QRM between stations. The "Cap'n Crunch" loop goes a long way towards providing the necessary antenna facilities.

The schematic

Fig. 1 illustrates the somewhat unusual schematic and unusual circuitry.

A multiturn loop (L) is resonated in a balanced circuit by a 2-gang x 500 + 500 pF variable capacitor, with the addition of C1 across the winding. C1 is a 130 pF capacitor, across which is wired a small padding capacitor to make final adjustment to get the loop into the 130/195 kHz spectrum (see text). These capacitors can be ceramic disc, silver mica, or mica, and the voltage rating is not important, making it possible for most to find them in the junk box. The coaxial feedline is

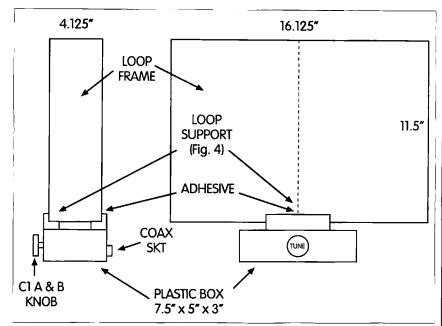


Fig. 2. The assembly.

coupled to the loop with capacitor C1, which is a 300 pF that can also be found in the junk box. SKT is a coaxial socket of a convenient type.

Profile

Fig. 2 shows the profile of the final loop assembly. It consists of a box frame (Fig. 3), onto which is wound loop "L". The frame is mounted on an inverted plastic box/base containing the variable capacitor C2A+B, on the front, and the coaxial socket at the rear.

Loop frame winding

The frame used on the prototype was of negligible-weight thin cardboard construction, made from two breakfast cereal (hence the Cap'n Crunch) cartons glued together side by side, as shown in Fig. 3. Each carton was the popular size of approximately 11-1/2" x 8" x 4-1/8". After gluing them together,

wind two layers of wide masking tape around the circumference. The final dimensions are 16-1/8" x 11-1/2" x 4-1/8". At this stage, you can apply a coat of emulsion paint to the faces of the box frame, to cover the advertising and logos.

The winding consists of a 100-meter (333-foot) reel of PVC-covered hookup wire, single core 1/0.6 mm (22 AWG) sheathed PVC to an overall diameter of 1.2 mm. The closewound winding should be started about 1/4" from the frame edge, and conveniently fills the width to about 1/4" from the other edge. The whole reel of wire is used. At the center bottom, 8"-long leads should be left for cutting back and soldering later. The use of PVC wire effectively spaces the wire turns.

Around the outside of the winding, wind a layer of PVC insulating tape.

An alternative thin cardboard frame could be made by cutting down larger cartons, or from cardboard sheets, with the aid of scissors, a scalpel, a stapler, sticky tape, and a tube of adhesive.

For those who prefer a wood frame, a simple design is shown in Fig. 3(b). Using this will, of course, multiply the overall weight of the final assembly by several times.

The box/base unit

The plastic box I used was a mi-



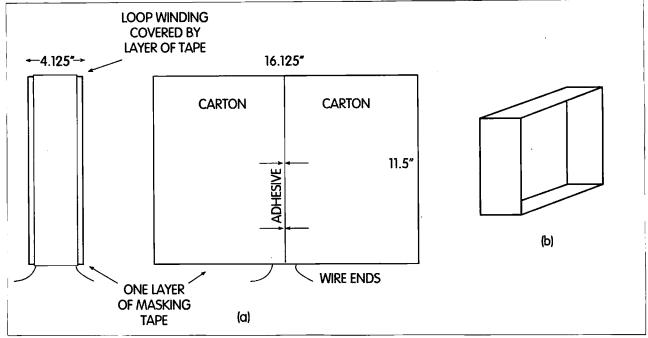


Fig. 3. (a) Loop frame and winding. (b) Alternative wooden frame.

crowave/freezer box 7-1/2" x 5" x 3" (**Fig. 2**). Any similar size of plastic box would do. The variable capacitor C2A+B is mounted at the front. A rigid 500 + 500 pF air-spaced type should be used. The coaxial socket (SKT) is mounted in the center of the rear. The box is inverted so that the original push-on top now forms the base.

Final assembly

Two simple loop supports are required, made of wood (see **Fig. 4**). Screw these to the base unit as shown, so that the loop frame/winding is a snug fit.

Pierce two holes in the top of the box/base, then pass the 8" ends of the loop winding through the holes. The box frame is held in position by a small spot of adhesive, as shown in Fig. 2.

The loop ends are cut back and connected to the tuning capacitor (**Fig. 1**). The other wiring should be completed using 18- or 20-gauge tinned copper wire. All connections should be securely soldered. No mechanical joints should be used.

NOTE: Cx is not connected at this stage.

Testing and operation

The loop should be connected, with a short length of coaxial feedline, to a good receiver covering the required frequency range. Stand the loop on a nonmetal surface. Next. check the loop frequency range. You will find that the LF end is a few kHz higher than required. This can be lowered a little, as required, by the addition of capacitor Cx, which on the prototype was a 56 pF silver mica in parallel with C1 (130 pF).

This produces the frequency range required —130–195 kHz.

The tuning capacitor is quoted as 500 + 500 pF, but in practice this is the manufacturer's nominal value, which may vary by as much as ±20 pF from manufacturer to manufacturer. It may be necessary to experiment with the value of Cx to compensate for this factor; with the adjacent values to 56 pF (Cx) ±. For example, unlike on HF frequencies, the addition of, say, 20 pF has only a minimal effect on the low frequency end of the tuning range.

Next, check the nulling on a suitable carrier (BFO On) around 140 kHz. The loop, rotated edge-on to this station, will produce maximum signal strength. Rotating the loop to 90 degrees should produce 100% nulling, except on the strongest local signal. Similarly, rotation of the loop should eliminate or greatly reduce QRN of the atmospheric and man-made types, which can on occasion be quite devilish.

The loop is remarkably sensitive for its small size. At my QTH, with a very sensitive receiver, a preamplifier is not necessary. In fact, it produces intermodulation! With less sensitive receivers, a preamplifier may be needed

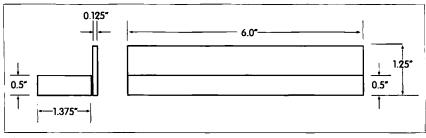


Fig. 4. Loop support.

Generating SSB

Use this tutorial to better understand — or better build — your next project.

Generating a single sideband (SSB) signal or, more accurately, a single sideband suppressed carrier (SSB/SC) signal, became necessary when SSB became the dominant communications mode in the HF bands. The battle between AM and SSB was won when the congestion on the bands became intolerable. While SSB has many advantages over AM, simplicity is not one of them.

SB requires only half the bandwidth of AM and doesn't require the transmission of a carrier. Using only half the bandwidth theoretically doubles the number of transmissions that can exist in a band, and eliminating the carrier got rid of a great potential for producing heterodynes and interference in the receiver. Eliminating the carrier also reduced the power demands of the transmitter. Eliminating the carrier was good riddance.

Generating an SSB signal is now commonplace, even though it's complex. The home-brewer must face these complexities and make trade-offs in implementation, cost, and parts availability to accommodate his particular situation.

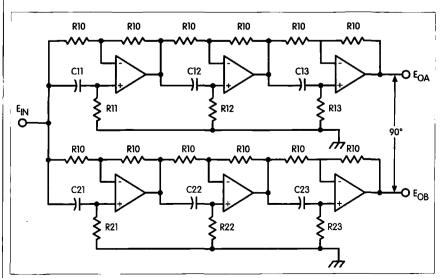
The chief disadvantage in generating an SSB signal has been the need for special, and usually expensive, components such as crystal filters or 90° audio phase shifting networks. The initial cost and availability weigh heavily against the filtering method of generating SSB. Audio phase shift methods require precision parts for good phase shift control and sideband suppression. A side issue of the phase shift method

is the bandwidth that can be achieved with a particular implementation. The bandwidth for communications is relatively broad, about 300 Hz to 3000 Hz, or 10:1.

Generating a single sideband by filtering is the most straightforward method. It usually starts by generating a double sideband suppressed carrier (DSBSC) signal with a balanced modulator that produces just the upper and lower sidebands — the carrier f_c is

suppressed. If the modulating frequency is restricted to 300 Hz to 3000 Hz, the output of the balanced mixer is two bands of frequencies. f_c+300 Hz to f_c+3000 Hz and f_c-300 Hz to f_c-3000 Hz. Therefore, to select one sideband requires a filter that cuts off in the interval between f_c+300 Hz and f_c-300 Hz; that is, an interval that is twice the lowest modulating frequency.

When the carrier f_c is even moderately high, the filter requires extremely



A side issue of the phase shift method | Fig. 1. An active phase shifter produces 90±0.1° of relative phase shift.

Name	Computed Value	Standard Value	Mfr. P/N
C11, 12, 21	1000 pF	1000 pF*	Xicon PF1H 102G
C13, 22, 23	0.01 μF	0.01 μ F *	Xicon PF1H 103G
R11	16.09 k	16.2 k**	RN55D 1622F
R12	118.3 k	118 k**	RN55D 1183F
R13	510.5 k	511 k**	RN55D 5113F
R21	55,14 k	54.9 k**	RN55D 5429F
R22	23.79 k	23.7 k**	RN55D 2372F
R23	174.9 k	174 k**	RN55D 1743F
* = ±2%	. ** = ±1%.	•	•

Table 1. Parts list.

high Qs that can only be achieved with crystals or mechanical filters. Crystal filters typically operate at several MHz while mechanical filters usually operate below 500 kHz. These filters are moderately expensive and operate at a fixed frequency. Of course, the fixed filter frequency can be moved to the desired frequency in another mixing step.

The home-brewer usually opts for the phase shift method of generating SSB even though generating the audio 90° phase shift is not a simple process.

Early on, an RC lattice network was used to obtain the phase shift. Barker and Williamson was a commercial source for a phase shifter. The homebuilt phase shifter had limited bandwidth and was sensitive to component variation. Now, an active all-pass phase

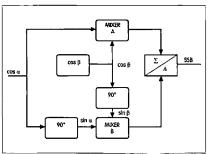


Fig. 2. Single sideband can be generated by phase shifting.

shifter is a better solution, even though it is still sensitive to component variation.

In the *Electronic Filter Design Handbook* by Williams, active all-pass sections are shown that can produce $90\pm0.1^{\circ}$ of phase shift over a 10:1 bandwidth. A six-section filter with $90\pm0.1^{\circ}$ phase shift, which translates into about 55 dB of sideband suppression, is shown in **Fig. 1.** The parts list is given in **Table 1**.

In the phasing method of generating an SSB signal, shown in **Fig. 2**, the audio signal is split into two equal amplitude channels separated by 90° and mixed with quadrature local oscillators. The mixer outputs are added to produce just the lower sideband or subtracted to produce just the upper sideband. The 90° phase shifts and amplitude equality are critical in that they determine the sideband suppression.

The sideband suppression is approximately 20 x log(tand/2) where d is the total deviation from 90° of both the audio and the local carrier. A total error of about 1.1° is required for 40 dB of sideband suppression. Of course, the amplitudes of both channels must also be equal.

The trig identities used in describing the various processes are:

Cosa x Sinb = 1/2 x [Sin(a-b) + Sin(a+b)] (Eq 1)

 $Cosa \times Cosb = 1/2 \times [Cos(a-b) + Cos(a+b)]$ (Eq 2)

Sina x Sinb = 1/2x [Cos(a-b) - Cos(a+b)] (Eq 3)

 $Cos(f+90^\circ) = Sinf$ (Eq 4)

Sin $(f+90^\circ)$ = Cosf (Eq 5)

When two sine waves $E_a Sina$, the audio modulating signal, and $E_b Sin\beta$, the carrier to be modulated, are mixed or multiplied, the result is $E_a Sina \times E_b Sin\beta$. Trigonometric identities show

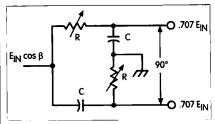


Fig. 3. 90° of phase shift for a single frequency is almost trivial.

the product E_a Sina x E_b SinB, equation 3, to be equal to:

$$E_a = E_a E_b \times 1/2([Cos(a-b) - Cos(a+\beta)]$$

The term Cos(a-B) is the difference frequency or lower sideband, and the term Cos(a+B), is the sum frequency or upper sideband. The amplitudes of both the sum and difference components are proportional to the term E₂E₃/2 and have no influence on the frequencies or the phase produced. Therefore, the amplitudes are not identified in the following descriptions.

In the phasing method of SSB generation, the modulating signal Cosa is split into two channels. One channel is shifted 90° to become Sina (eq 4). The local oscillator Cosß is also split into two branches of Sinß and Cosß. The Cosa signal is mixed with the local oscillator Cosß in mixer A to produce an output of Cosa x Cosß (eq 2). The Sina signal is mixed with local oscillator Sinß in mixer B to produce an output of Sina x Sinß (eq 3).

From the trigonometric identities equations 2 and 3, the outputs of the two mixers are seen to be:

A channel = $Cosa \times Cos\beta = Cos(a-\beta)$ + $Cos(a+\beta)$

B channel = Sina x Sin β = Cos(a- β) - Cos(a+ β)

When the outputs of the two mixers are summed, the result is Cos(a-B), the lower sideband, and the upper sideband cancels. When the outputs are subtracted, only the upper sideband, Cos(a+B), remains.

Continued on page 16

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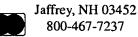
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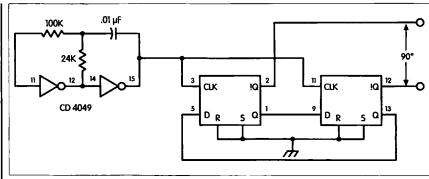


Fig. 4. Exactly 90° of phase shift can be produced digitally.

Generating SSB

continued from page 14

Obtaining an approximate 90° phase shift for a fixed local oscillator frequency is straightforward, but obtaining exactly 90° requires a bit of component adjustment and accurate measurement. Quadrature local oscillators can be produced with Rs and Cs as shown in Fig. 3. For example, plus and minus 45° phase shifts are obtained with simple low-pass and high-pass RC filters. The low-pass filter has a phase shift of -45° when $R = X_c$. The phase shift for the high-pass filter is $+45^{\circ}$ when $R = X_c$. The relative phase shift then is 90°:

While the RC phase shifter for the local oscillators is simple in concept, the devil is in the details. The output voltage of each filter is 0.707 x $E_{in} \angle \pm 45^{\circ}$ only when X_c is exactly equal to R. Unfortunately the tolerances of the R and C aren't zero, and 5% parts can produce a phase error as great as $\pm 3^{\circ}$, which limits the sideband suppression to some 30 dB even when the audio phase shift is exactly 90°. Therefore, R must be adjusted to make $R = X_c$ and $E_{mus} = 0.707 \text{ x}$ E_{in} .

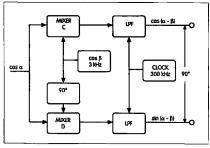


Fig. 5. Wideband phase shift can be produced by mixing.

An exact 90° phase shift for the local oscillators can be obtained digitally with a dual D flip-flop as shown in Fig. 4. In the D flip-flop, the data on the D input is transferred to the Q output on the transition of the clock. Therefore, quadrature signals are produced when both flip-flops are clocked simultaneously and the not-Q output of one is fed to the D input of the other. The two Q outputs are separated by exactly 90°, but in the process the clock is divided by four.

The maximum clock frequency depends on the flip-flops used. For example, the CD4013 CMOS ICs can be clocked up to 3.5 MHz when operated from 5 V, or 12 MHz when operated from 15 V. When operated with a 12 V supply, quadrature local oscillators up to 3 MHz can be produced. The digital scheme is essentially independent of frequency and is dead-on 90°. The fact that the output is a square wave has no influence on the mixing, but does determine the harmonics and their amplitudes present in the output.

An active audio phase shifter with its close tolerance parts can be avoided by the mixing scheme shown in Fig. 5. The audio signal Cosa is applied simultaneously to two mixers C and D which mix the audio with quadrature local oscillators Sinß and Cosß. From the trigonometric identities of equations 1 and 2, the outputs of mixer C and D are:

C mixer = Cosa x Cos β = Cos(a+ β) + Cos(a- β)

D mixer = Sina x Cos β = Sin(a+ β) + Sin(a- β)

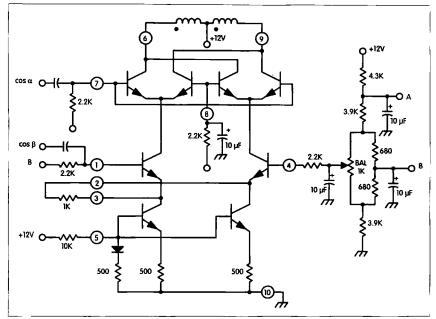


Fig. 6. An MC1496 mixer can operate from DC to VHF.

The outputs are in quadrature. Sin(a-B) and Cos(a-B) can be used in the phase shift method of generating single sideband shown in Fig. 2.

When the difference outputs of mixers C and D are applied to mixers A and B of Fig. 2 and mixed with quadrature local oscillators Cosw, and Sinw_e the outputs of mixers A and B

A mixer = $Cos(a-\beta)$ x $Cosw_{\alpha}$ = $Cos(a-\beta-w_a) + Cos(a-\beta+w_a)$

B mixer = $Sin(a-\beta)$ x $Sinw_a$ = $Cos(a-\beta-w_{o}) - Cos(a-\beta+w_{o})$

Adding the outputs of mixer A and mixer B results in Cos(a-\beta-w_), with Cos(a-\beta+w_) suppressed. Recall that

Continued on page 18

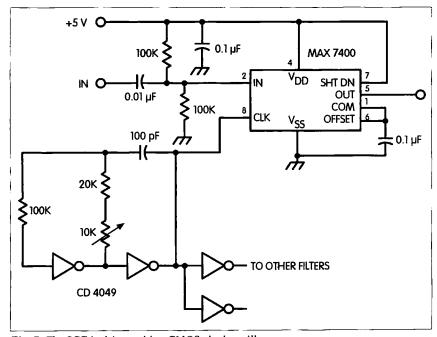


Fig. 7. The SCF is driven with a CMOS clock oscillator.



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Generating SSB

continued from page 17

a-B is the lower sideband of the mixers C and D.

There is no restriction on the frequency of a, β , or w_c . However, from a practical standpoint β should be as low as possible to simplify filtering. To that end, the local oscillators Cos β and Sin β are made equal to the maximum audio frequency, 3 kHz. The outputs of mixers C and D then are each two bands of frequencies 0 to 2700 Hz and 3300 Hz to 6000 Hz in quadrature. The difference frequency, 0 to 2700 Hz, can be selected with a low-pass filter for use in the phase shift method of SSB generation.

To ease the filter requirements, mixers C and D should have outputs that are free of the inputs a and B. Eliminating these inputs is critical because they have frequency components that are the same as the desired (difference) output and cannot be removed by filtering. A solution is at hand: a double balanced mixer has an output that is free of the two inputs a and B.

Double balanced mixers such as Mini-Circuit's used at IF and RF are





inappropriate here because the inductances of their internal transformers are too small for the audio frequencies. However, Motorola makes a double balanced IC mixer, the MC1496, that operates from DC to VHF and suppresses both the audio input Cosa and the carrier input Cos β by more than 50 dB when the inputs are between 60 mV_{rms} and 500 mV_{rms}.

The inputs to the mixer can be either differential (push-pull) or single-ended. Single-ended drive is simpler but requires bypassing of the undriven input. The coupling and bypass capacitors should be sized according to the frequencies involved: 10 µF for audio and 3 kHz carriers and 0.01µF for carriers above a few hundred kHz. The outputs are push-pull and a 1 $k\Omega$ center-tapped audio transformer is desired for the low frequency mixers. The mixers A and B operate at RF, and an RF transformer is required. Singleended drive with a single +12 volt supply is shown in Fig. 6.

The mixer is available in either a 10-pin 603 case, similar to a TO-5, or a 14-pin DIP. The pin numbers shown in the drawing are for an MC1496G metal case. The pinouts for the MC1496P 14-pin DIP and MC1496G metal can are different.

The low-pass filters on the output of mixers C and D must reject the upper sideband and any residual local oscillator in the output and have the same relative phase shifts. That is, the filters must pass 0 to 2700 Hz and reject 3000 Hz and above. The absolute phase shift through the filters is not important but the relative phase shifts of the filters must be equal.

The low-pass filter can be either active or passive. An active filter is the most practical. A switched capacitor filter (SCF) IC. such as MAX7400CPA shown in Fig. 7, is available from Maxim Integrated Products. The IC is described as an 8th order elliptical SCF IC in an 8-pin DIP package that operates with a +5 volt supply and draws less than 3.5 mA. The IC offers all of the required features: high attenuation rates, close tracking of phase and insertion loss. The maximum input voltage should be restricted to about 4 V_{pp}.

According to Maxim's designer, phase tracking is not a tested parameter, but the design is expected to produce lot-to-lot tracking of much better than 1°. The ripple in the passband is less than 0.3 dB and is also the same from lot to lot.

The corner frequency (3 dB point) of the MAX7400 SCF is 1/100 of the clock frequency. Therefore a corner frequency of 3 kHz requires a 300 kHz clock with a duty cycle of 40% to 60%. Of course, for frequency tracking, the SCFs must be driven with the same clock. A separate oscillator, made with a CD4049, U1 in Fig. 7, provides the squarewave clock for all the filters.

The frequency of the clock oscillator is about 1/1.39RC. Therefore, producing a 300 kHz clock requires an RC of 2.4 x 10^{-6} . A $100 \pm 5\%$ pF capacitor and a 10k pot in series with a $20k\pm 5\%$ fixed resistance can set the clock for exactly 300 kHz.

While the maximum audio frequency is assumed to be 3 kHz, it is not guaranteed. A filter located between the microphone and the modulator can ensure that there are no frequencies above 3 kHz. This need to restrict the bandwidth is applicable to any method of SSB generation. The input filter need not be exotic — it can be passive or active — but the MAX7400 seems to be a good choice.

The MAX7400 can be ordered from Digi-Key, 701 Brooks Ave. South, Thief River Falls, MN 65701-0677; phone: 1 (800) 344-4539.

The phase shift method of generating SSB eliminates expensive and difficult-to-obtain filters, but at the expense of precision audio phase shifters. The mixing scheme for generating quadrature audio signals even avoids the audio phase shifter. While the mixing scheme doesn't require precision parts, it does require a pair of filter ICs and mixers. All in all, the mixing scheme seems a reasonable trade-off that should be considered for your next home-brewed transmitter. For what it's worth, baseband signals greater than 3 kHz can be accommodated without extra effort.

Ham Ambassadors

Will you help capture the would-be hams that could slip away?

Amateur radio instructors and volunteer examiners are one of the most important links for the continued growth of our amateur radio service. These volunteers are many times the first contact a prospective ham encounters, and it is important to the growth of our hobby and service to supply our "first contacts" with the right "selling tools" that won't let a prospective ham fall through the cracks and somehow not take the exams and get licensed.

e are losing more than the few who make it! Need more proof? Consider this - estimate the number of Now You're Talking ARRL books sold to prospective hams, and add in the thousands of books Technician class Element 2 sold at over 7,000 Radio Shack stores in the country. Now add in all of the combined books sold at dealer and distributor levels, and then factor in all of the entry-level computer courses sold to prospective hams.

Now look at licensing figures, and chances are for every 20 or 30 entrylevel books sold, only one new ham emerges. Ever wonder where the other 29 went?

"So I start reading the new Element 2 Technician class book, and I decide it might be fun to learn more about ham radio activities. I go into the local ham radio store, and the salesman is busy on the phone and directs me to go look on the bulletin board for a ham club," comments a retired medical doctor, wishing to add ham radio as a new hobby for when he and his wife go RVing.

"There is no phone number for the club nearby, so I show up at their meeting unannounced, and I never really made contact with a ham club member who might give me some enthusiasm for ham radio in an RV," adds the doctor. Ultimately, he calls an 800 VEC listing and locates the phone number of a nearby accredited volunteer examiner.

"I called the volunteer examiner, and she couldn't have been nicer - she went out of her way to double-check that I had the right study materials. knew where the examination was to be given, and what to bring to the exam location. She really made me feel I was important during my first steps of getting the ham license," adds the doctor.

I call these outgoing positive first contact men and women "Ham Ambassadors." Almost every club has one, and almost every VE team has one, and anyone spending a lot of their

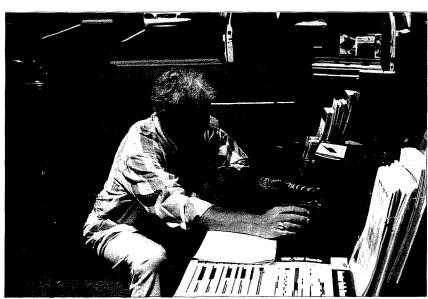


Photo A. Manufacturers offer free band charts and world maps to instructors teaching ham classes.



Photo B. Manufacturers all indicate they are happy to support Ham Ambassador instructors and examiners.

own personal time teaching a ham class for free has definitely qualified themselves as a *Ham Ambassador*. These men and women have the skill to see new prospective hams find a local radio club, feel welcome within the club, see them to the exam session, and finally watch them make their first transmission over the airwaves.

The American Radio Relay League has the largest database of active instructors. These instructors are teaching classes in schools, clubs, at the Red Cross, and are sometimes renting facilities on their own. They may receive a distinctive ARRL instructor's name badge, and receive the instructor's newsletter that comes out several times a year. They might also be on an Email connection to the League.

The W5YI Group has found many of its accredited volunteer examiners are also instructors, and they offer an instructor patch for those who request it.

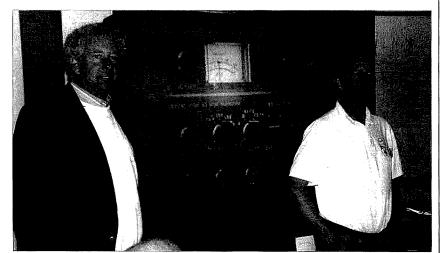


Photo C. Author West (L), training a new instructor Ham Ambassador at a first-ever video conference ham class.

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Both the League as well as W5YI may also offer instructors a small discount on books and computer programs.

We are not doing enough for our Ham Ambassadors!

Manufacturers like ICOM America, Kenwood Corporation, Yaesu, ADI, Alinco, and several other amateur radio manufacturers all indicate they want to do more for the *Ham Ambassador* who is making our amateur radio service *grow*.

"Every year we produce thousands of dollars of band charts, log books, wall maps, pens and pencils, grid square maps, and license holders to be given out free to licensed hams and prospective students," comments an industry representative at a recent meeting in Dallas, Texas.

"Getting these materials into the hands of the *Ham Ambassador* is a problem — how do we know at a hamfest who is teaching a class for 100 students, or who is looking for 100 wall maps to paper the inside of their shack," adds the industry representative. "And how many times have we been asked to donate or sell at a steep discount equipment for use in the classroom, only to find out the class never occurred and the equipment was never returned," comments another industry representative.

"As an industry, we have materials and deals available for those that are making the amateur service grow. What we need is a single point of contact to qualify and reward those volunteer Ham Ambassadors who are really producing results," adds yet another industry rep.

Equipment and accessory manufacturers don't have the time to coordinate this program, but they do have in place equipment programs to offer discounts to those in the business of amateur radio. Manufacturers will offer dealer employee discounts beyond normal dealer discounts. They may also authorize dealers to sell a piece of equipment at dealer cost and spiff that dealer for the accommodation sale to someone special in the industry. And that someone special would be you, the elmer, instructor, VE, or Ham Ambassador

Technician and General Class Instructor Homework.

No, this is not homework for you, the instructor, but rather pre-study homework for your students before each class session.

It's much easier teaching a ham class when the students have pre-read the chapter you are going over in either Technician class or General class study. Same thing with the code — having the students somewhat familiar with some of the new code characters makes it easier for you in the classroom.

Home study questions and answers are now available for our Technician Element 2 and General class Element 3 West textbooks. The open book exercises are to be completed by your students before they come to the class. The questions in the homework are phrased in an upbeat manner in order to take the edge off of having to come to class and pass a test. Rather, they are a fun way to get the students reading the book, looking up specific page numbers to find answers, and filling in their answers in the home study workbook.

On the back side of each page are lines for code copy. Just lines — and plenty of them. On the Gordon West 6-tape code course, we make it clear that the code copy should be kept in a continuous page-by-page book. This will allow the students to see their CW progress, and it also allows for the instructor to see exactly where the students are on the code tapes.

The students write down their practice on the back side of each home study page. This way the code will not get lost as part of the overall prestudy homework book. When the students come to class, everything is in one nice, neat package.

Soon there will be the additional page-by-page demonstration guide paralleling every page of the Gordon West textbook. Instructors who teach one sub-element an evening will see exactly what items they may wish to bring to class to better describe the components found in that sub-element. There will also be a resource guide on how to contact the ARRL for instructor color 35mm slides, ARRL overhead transparencies, and a list of ARRL video tapes for instructor loan.

The instructor's guide will also contain information on where to order additional reference materials for the students to purchase. This could include the ARRL Antenna Book, the ARTSCI Repeater Map Book, ARRL RF Exposure book, Master Publishing Basic Electronics book, and for those students planning on going for Extra class, the West GROL Licensing Guide.

The instructor guide will also recommend specific class sessions to give out some of the free manufacturer frequency guides, band plan guides, and world charts. This way you give out your classroom materials in order of their appearance in the text.

who is helping our amateur radio service grow.

But again, the industry comes back with the statement, "But who will handle the program to get these free training materials and equipment discounts to the people really contributing to the growth of our hobby?"

The potential for amateur recruitment is great with this program.

Say you saw it in 73!

At the dealer level, store managers are always on the lookout for any special VE or ham instructor that will be contributing success to beginners wanting to get licensed and enter our hobby by acquiring equipment.

"If I have an instructor who is really turning out the numbers, you could be assured I will take care of them when they need a demo radio," comments one Midwest dealer.

"We have a VE team that travels several hundred miles a year giving exams in remote parts of our state, and you

The Gordon West Study Guides

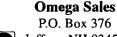
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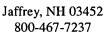


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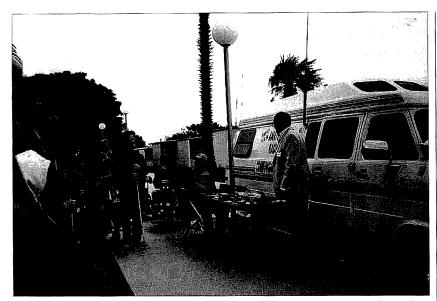


Photo D. Author West working with handi hams and recruiting more Ham Ambassadors.

may be assured those VE team members will be well taken care of because they are helping our service grow," adds another southeast store manager.

The plan

Step 1 in the Ham Ambassador program is to identify those active hams who are making things happen in their area. We could then identify their "territory" and begin passing leads to them that we might get from, let's say, a small ad in an RV, an aviation, a camping, or marine publication. This Ham Ambassador would also receive a list of free manufacturer training materials that they could bring in for their upcoming class. A single \$3.20 priority mail stamp could handle up to 2 pounds of training aids. A collection of these materials from many manufacturers would be available on a single order form, so getting maps, log books, frequency charts, and VHF band plans is like one-stop shopping — the only cost is a single priority mail stamp.

Instructor Ham Ambassadors could also bring in textbooks at up to 40 percent off, or the textbook supplier could forward the name and call sign of the

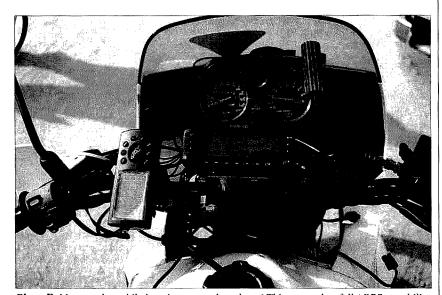


Photo E. Motorcycle mobile ham is a great class demo! This system has full APRS capability.

Photo F. Gordon West's Study Guide for General Class. One of the three books in Gordon's series.

instructor on to a local dealer and work the discount through the dealer. Most dealers would see the value of supplying textbooks to students discounted through the instructor by knowing the instructor is going to refer those students back to the dealer when it comes time to buy the equipment. If dealers take good care of the instructor's needs, including classroom demo equipment, many of the equipment sales will probably come back to that same dealer because of his or her support. The savvy dealer would also include their company brochure in each book sold to the instructor.

At the VE level, colorful, large, band-plan charts showing frequency allocations may soon be in high demand. This author has formally recommended to the National Council of Volunteer Exam Coordinators (NCVEC) that they expand what is now available at the test location for reference during the actual exam. Did you know that NCVEC approved the use of the Ohms Law circle on written exams? Why not include one of the manufacturer's band plan charts to allow the students to look up frequency segments during test taking? This would allow instructors to spend more time on showing students how to use these band plan



Photo G. Kids and CW are a perfect match — West issues an Element 1 CSCE.

charts as opposed to simply rote memorizing the frequency limits. These charts would especially be helpful on those questions dealing with "gentlemen's agreement" that may not be found in Part 97. Since many accredited volunteer examiners are also amateur instructors, these charts and tables would certainly be of use in the classroom, if not the exam session.

The well-structured Ham Ambassador program may seem an impossible task to organize, yet the amateur radio service needs it more than ever. We need to up the number of sales we are presently getting from leads, and a

strong program will seal in the gaps when people get the book and don't follow through on obtaining the license.

If you are teaching or testing in the amateur service, or if you are just one of those club good guys that everyone is turning new prospective hams onto, let me hear from you so I can immediately begin sending you my big collection of manufacturer free coupons, charts, band plans, and VHF/UHF grid square guides. Describe your activities, name your "selling territory," and let's see what I can do to get you the materials to make your efforts even more powerful than they are right now.



Photo H. Hams who help teach Red Cross classes could become Ham Ambassadors.

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School's In!

Go on a "lecture circuit" to the local school — and promote your favorite technical hobby.

This article tells of a presentation I gave to my daughter's grade school class. The topic? My favorite, of course — weather satellites! We all remember that twinge you get in your stomach when you have to speak in front of the class, but this time it was different! I had this burning desire to tell these kids about an exciting hobby, while at the same time not boring them to death; hopefully, I would be teaching them something and ultimately getting them genuinely interested in doing more research on their own.

y presentation was done using my semiportable, home-made 4-foot dish, downconverter, VHF scanner, and PC. I digitized several pictures live, and showed them some pictures I had taken previously.

The plan

Preparation is the most important part.
You must have a very well ordered

outline of what you want to cover and how to present it. At the same time, you must be able to hold the attention of the class. I spent 10 to 15 minutes at a time over several days deciding what would be interesting and important to discuss. My outline is shown in **Sidebar A.**

Notice that there are times shown for each section. Estimate how much time

take, then total up the times. Limit the amount of time for the total presentation based on the age group you'll be addressing. Younger children have a shorter attention span, and the topics should have a high "wow" factor. Older children have longer attention spans, so you can delve deeper into each topic. After you have the outline finished, contact the teacher and ask if they would be interested in having you do a presentation on your special topic. If the answer is "no," I'll be very surprised! Everyone needs a little break in their routine workday - including teachers. After you get a "go ahead," give the teacher a copy of your outline. Then ask the teacher if there are any suggestions or changes to your outline. Tell the teacher that you will need to check out your equipment before they ever mention to the students that tomorrow (next week, etc.) they will be having a presentation on your special topic. You don't want to tell the class that something will happen and then have to back out because of interference, etc.! Such things as high-powered radio services near the

school, noisy power lines, etc., can

each section of your presentation will



Photo A. Here, the author explains a diagram of how the waves bounce off the dish surface and focus into the feedhorn. To the right, on the board, is the formula for a parabolic, and a plot of the formula. (Both photos by author's wife, Yvonne.)

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Sidebar A: Presentation Outline

- 1. Do one picture to start out. Demonstrate what signal/picture "sounds" like. Introduction 10 minutes.
- 2. Has been one of my favorite hobbies for 15 years. Info from books, magazines, Internet.
- 3. Pictures are free no scrambling.
- 4. Satellite types/orbits/names/launching countries. Why do the satellites stay up there? 10 minutes.
- a. Geosynchronous orbit time is exactly 24 hours, so it appears to stand still, straight above equator; size is about 10 feet in diameter and 6 feet high. Speed of orbit is 7,000 mph, is in a parking space about 300 miles on a side, fuel to reposition, cost is \$80 million each. Can't fix if fuel runs out since it is so far out even the Space Shuttle can't go that far.
 - b. Orbit forces gravity = centrifugal force.
 - c. How an image is scanned: one line every 1/4 of a second x 240 seconds (4 minutes per picture).
 - d. Use globe and small object to show relative size of orbit and Earth, 22,500 miles up vs. 450 miles up.
- e. Polar orbiting go over North and South Poles, much faster orbit, every 140 minutes, much closer, much better view plus can view poles when geosynchronous cannot. Size is about 10 feet long and 3 feet square. Speed of orbit is 15,000 mph.
 - f. Polar orbiters also do SAR (Search and Rescue) data collection, plane crash search.
- g. Countries launching weather satellites are US (GOES), Russia (GOMS), Europe (Metoesat), Japan (GMS), China (Feng Yun).
 - 5. Computer software free, person wrote it for the fun of it. Show how it works, scroll, zoom 3 minutes.
 - 6. Image types 10 minutes.
 - a. Water vapor shows humidity and dry areas of atmosphere can see equally well at night or in daylight.
 - b. Visible limited information.
- c. Infrared temperature of land, water, clouds temperature of clouds indicates how high up and how severe the weather is below them. Can see equally well at night or in daylight.
 - d. Maps showing isobars, air temperatures, winds.
- e. Polar-orbiting relay since geosynchronous can't see poles, NOAA relays pictures from polar satellites to geosynchronous satellites.
 - f. Resolution: About 2.4 miles is best available.
 - g. Show schedule of picture types: "TV Guide of Weather Satellites."
- h. Samples of each type: water vapor, 4 km US; Northern Hemisphere, whole disk, infrared Northern Hemisphere, whole disk, polar-relayed of Australia.
 - 7. Who uses the pictures from the satellites? 5 minutes.
 - a. The Weather Channel on TV you and I.
 - b. Farmers temperatures, humidity, cloudy/clear areas.
 - c. Ships water temperature, winds.
 - d. Military if fighting a war, must know weather for soldiers, planes, ships.
 - e. Fishing industry water temperature some fish go deep if water is too hot/cold.
 - f. Airlines need to know wind direction to get best fuel economy.
 - g. Hurricane tracking direction it is moving and if it is getting stronger/weaker.
 - 8. Satellites cannot predict the weather we need humans for that!
 - 9. Equipment, books, articles 5 minutes.
 - a. Dish home-made design, used math to get curve, how it works, article, \$25 for parts.
 - b. Feedhorn 2-lb. coffee can, show inside probe, gathers signal by focusing the signal into the feedhorn.
 - c. LNA kit from HP.
 - d. Downconverter designed and built own.
 - e. Filter designed and built own; article.
 - f. Police scanner.
 - g. Quad helix same shape as on satellite \$10.
 - h. Books Weather Satellite Handbook: Satellite Experimenter's Handbook
 - i. Software for computer is free.
 - 10. Hand out pictures of satellites.

Sidebar B: Equipment checklist:

PC, Keyboard Mouse

Monitor

Interface cable, scanner to sound card

Type N connector cables

Type BNC cables

VHF scanner and power cube

Operational downconverter

BNC barrel adapters

VHF Quadrifilar helix antenna

BNC EZ-hooks

Outlet strip

Extension power cords

Stand for dish

Dish

Feedhorn

Rope — to transport dish on car

roof

Globe

Weather Satellite Handbook

Magazine articles

Satellite Experimenter's Handbook

"TV Guide of Weather Satellites"

Listing of sample pictures Old boards — filters.

downconverter

really ruin an otherwise great presentation. Remember a guy named Murphy? He's alive, well, and watching you — and ready to trip you up. Take one step at a time and he'll stay out of your way!

I enlisted the help of the school's computer teacher and asked for the largest monitor available so that the class could see the images clearly from the back of the room. My monitor is a 14-inch hamfest special. The computer teacher supplied me with a 29-inch SVGA monitor — my pictures never looked so good! (By the way, I brought along my own monitor just in case there was a problem with the big one.) The teacher also kindly helped me with the setup and teardown of the equipment.

Be sure to do a site survey in person, noting where you can place your equipment [including antenna(s)], route cables, obtain power, etc. Make a list of everything you'll need to do the demo. Then go over it again and again and again, making sure you haven't forgotten anything. See my list in Sidebar B. Bring extra coax, power extension cords, and coax connectors so that you can string long pieces together to be sure that you can reach as far as needed.

Bring handouts, pictures, old PC boards of your hardware, books, etc., to make your presentation more than a lecture. After the demo, I brought my dish inside, let them look at it closely, and passed around the feedhorn. The downconverter that I used to do the live pictures was mounted in a metal chassis that had a clear plastic lid —

this protected the delicate circuitry from lingers, but allowed them to see all the components. (By the way, the feedhorn is made from an old 2-lb. coffee can. I stressed this point to show them that this hobby is not necessarily expensive.) I used a little humor too: I have an NOAA listing showing the time each type of image is broadcast (infrared, water vapor, visible, etc.). I called it the "TV Guide of Weather Satellites."

Be sure to invite the head-of-school/ principal to your presentation. Ours didn't show up, and I'm not sure why. At least make the invitation. If they do choose to watch, they can see that the students are learning something practical.

What happened at class ...

First of all, the presentation went very well! I planned on 35 minutes and it turned into 60 minutes, with five to six hands up still wanting to ask questions at the end of the allotted time! If you REALLY know your topic, I promise you that you won't be nervous. I didn't even notice the time. Word of my presentation spread quickly — I thought I was to make a presentation in front of my daughter's class of 25 students and two teachers. At lecture time, I found out that they had invited all of grades 4 through 8! The 25 students were now 85, and the two teachers were now six!

The presentation began with my daughter's teacher introducing me: "I'd like to introduce Julie's dad, Jim. He's going to talk to us today about weather satellites." I started out by digitizing a live picture, describing it as it was forming the image on the screen. I interspersed my presentation with frequent interruptions for questions from the kids. I also repeated each question so that ALL could hear the question AND the answer. (Have you ever been to a lecture and couldn't hear the question? This makes the answer totally senseless sometimes.) Also, when a student asked a question I looked them in the eye with a smile showing undivided attention and a genuine interest in their question. Don't be afraid to admit you can't answer a question — "I don't know" is a perfectly



Photo B. This is after the presentation, showing the kids the curvature of the dish.

good answer, but be sure to offer to find out and get back to them. Here's a sampling of the questions they asked:

- 1. Why don't satellites crash into each other? Answer: All space objects are tracked very carefully, and new satellites are put into orbits where they stay far enough away from all other objects, like other satellites, space junk, etc.
- 2. Can satellites be repaired? Answer: Yes, some can be repaired. If they have enough fuel to push them low enough to be "grabbed" by the Space Shuttle, they can be repaired then relaunched, either from the Shuttle or from another vehicle.
- 3. How did you get interested? Answer: I read a two-part article by Dr. Ralph Taggart WB8DQT and Clayton Abrams K6AEP in the November and December 1984 issues of 73 Magazine. After I saw their pictures from the weather satellites, I said I wanted to be able to do that more than anything else!
- 4. How many articles have you written? Answer: Over the past six years I've written six articles on weather satellites and related equipment.
- 5. Are the satellites affected by Y2K (remember that?) or meteor showers? Answer: The satellites probably won't be affected by Y2K (my presentation was given in late November 1999 so the topic was really getting a lot of press). Yes, meteors can affect satellites, but there have only been a few satellites damaged by meteors in the last 30 years.

Two of the images I showed them were picked for effect. One image was a few weeks old and showed hurricane Floyd (it did a lot of damage to the East Coast, especially North Carolina). The other image was a live shot of an approaching storm front. I predicted that the rain would reach our location at about 3 p.m. — and it did, too! Murphy isn't always around!

I stressed the fact that I used math to find the required curvature of my dish. The math involved was simple algebraic manipulation of the parabolic curve equation — a topic that the 8th graders had already covered in their math class. This showed that there really is a

use for the math they learn, beyond passing an exam. I told them that without the formula, I could not get weather satellite pictures. I also drew a ray diagram on the board to show how all the incoming waves bounce off the surface of the dish and focus into the feedhorn of the dish.

I displayed an example of each image type (items 6a through 6e in the outline - Sidebar A) and told as much as possible about each image.

I ended my presentation when the teacher interrupted to say that the students had to get ready to go home. I thanked them for being so interested and for asking so many good questions. A brief round of applause followed, and then they spent about five more minutes looking over my dish, feedhorn, and downconverter.

One mistake I made was to hand out the pictures of the satellites while I was talking. If one of the students was looking at the pictures, then they weren't listening. I suggest any handouts should be done at the end of the lecture.

Where to from here?

I plan on doing a demo of ham radio next. There are a lot of details to work out. I don't want to call CO endlessly with no answers, only to lose their interest. Also, I don't want any

"language" problems that still do appear on the air from time to time. (Thanks to Riley Hollingsworth, the bands are MUCH better than they were just a few months ago!) You and I know that real life is not "Leave It to Beaver," so I'm going to pick my QSO very carefully - probably using a prearranged time and frequency to talk to a ham that I know. Also, I will make sure that the band chosen will be open and that there isn't any chance of a thunderstorm, interference from nearby equipment, etc.

Summary

It was fun and very refreshing to see hands constantly going up to ask good, well-thought-out questions. If I inspired even one of the students to learn more about weather, satellites, or the math that is involved, it was well worth the time and effort! My main goal was to inspire them to find an interesting hobby or topic and to learn all about it. I took one half-day of my vacation time from work to do the checkout and another half-day to do the actual presentation, and I must say that I'm very glad I did! It was VERY rewarding.

If you decide to do a presentation at a school on any topic, please write me and let me know all about it - I'd be very interested in hearing from you.



Adopt a School

More good tips on introducing the ARS.

Over the years, friends of mine often have attempted to bring ham radio into a school classroom. Just as often, their attempts have been unsuccessful. Why did this happen, when I have enjoyed a small but steady success with my own attempts to introduce technology into the classroom via radio? Please take a moment and let me share with you my experiences here in Alaska, as well as past successes in Las Vegas NV.

irst, what does it take to be successful? Now that many schools have connected to the Internet, what can you bring to the classroom? Many hams, in trying to bring amateur radio into the classroom, start by assuming a level of understanding far beyond that of the teacher or the class.

The second problem is often not meeting the needs of the class or teacher. Far too often, the helpful ham tries to push the hobby itself — not the opportunity the hobby represents. The fact that you can talk to someone in Madagascar or China or Lower Spit (UK), sometimes, just does not impress most children brought up on instant Internet communications and worldwide SATCOM. To make matters worse, most hams won't let the kids touch the equipment. What can you do to ensure your success?

Success comes from two main ideas: One, work with the teaching staff to fulfill their needs. Two, use shortwave listening (SWL) as a beginning. Both of these statements need a bit of explanation — let me give you an example or two.

I find a school near where I live, preferably one that children I personally

know attend. I approach a teacher on the staff and offer to add some excitement to a music, geography, or science class. A date and time is set. I then bring in a small shortwave receiver and tune in an English-language program appropriate for the class. The focus is on the content of the broadcast, not the radio set itself.

This type of effort has almost always been a hit. The bonus is that you will now have an advocate on

The Focus is on the content of the broadcast, not the radio set itself.

the school staff, and more visits are sure to follow.

In Las Vegas, I placed an old military receiver (R-390) in a fifth-grade classroom, provided training to the teacher on how to use the equipment, and left very simple, written operating instructions as a guide for the set. The teacher purchased a copy of *Popular Communications* magazine to have a short and current guide to what was on the air. The equipment was wildly

successful. Teachers fought over putting the set in their classroom.

More importantly, they told their friends about this radio. Phone calls soon followed. By the time I had transferred out of the area, over 15 radio sets had been placed in local school classrooms, and lectures had been given at area teacher in-service training at the University of Nevada–Las Vegas (UNLV) several times.

The local Las Vegas hams were very supportive of this effort. They donated older equipment, which I tuned or repaired as needed. Once up to speed, the equipment went to schools and operations and safety training were provided to the staff. The use was left up to the school. Lesson learned?

Once the opportunity is present, the students find a million things to use the equipment for — to fill their own needs. I give suggestions and technical advice on a regular basis to help, but just that: advice only. Here in Anchorage, a local middle school successfully applied for and received several thousand dollars in grants for a complete ham station — HF to SATCOM. I was able to assist in the grant writing, adding technical details with a focus on safety.

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Why use shortwave radio broadcasts? Well, no license is needed, safety concerns are at a minimum, and the receivers are relatively inexpensive. The wide variety of programming is tailor-made to fill just about any needs, from those of K through high school.

Remember, it is the content, not the radio, that is important. But don't worry — several teachers have asked for and received training to get their tickets.

What else can you do? I just finished a lecture at an area high school about shortwave radio, but the emphasis was on technology and language training. High school physics and science classes can use HF and SATCOM signals as a low-cost adjunct to class lessons. Prior to this, a demonstration of packet radio operations set the local school LAN/E-mail crowd a-buzz.

More? How about jobs? I have talked to several classes about the employment opportunities presented by being a trained ham radio operator, and having the electronic knowledge gained in studying for the license. Each student will view this information with different levels of enthusiasm; don't be too disappointed if someone falls asleep in class. Key on the school staff, at first — they are the most in touch with the needs of the students and the curriculum.

Anyway, back to the local high school staff. Once a solid staff constituency is in place, the local junior high schools feeding into this high school should be brought on-line with technology programs of their own. The final product can then be cloned into other schools with ease. So now an entire generation of local students will have the chance to know and use radios as part of their basic education.

Can you do this at your local schools? I believe so. All it will take is a commitment on your part to work with a school on a regular, long-term basis. You will have to do some homework, but basically the secret lies in finding what needs you can fill.

The equipment brought into the school should be safe! This means complete cabinets, grounded, and short, amplified indoor antennas. Training the teachers and putting together short, simple instruction guides for the staff and students is part of equipment placement. Older tube-type sets are fine, and donated sets can be solicited over the air. Once the program is in place, students may raise their own money - just be prepared to offer advice on the purchase.

Two schools I worked with in Las Vegas did just that. The students, on their own initiative, raised the money to buy used gear at local hamfests. We all had fun in the search and in haggling with the hams selling the radios.

So, do your homework and adopt a school. The future of US technology leadership is riding on your involvement!



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Read All About It!

Part 4 of good stuff from The Hertzian Herald.

Requiem for vacuum tubes, That's wrong!, Resisting temptation, and The lowly light bulb — the trivia wizard is on a roll.

here is a new (to me) TS-930 on my operating bench, and my venerable TS-820, with its spare 12BY7 driver and pair of 6146 finals. is stored in the closet. This marks the first time that I've had a shack with absolutely no vacuum tubes in it, and it seems fitting to speak a brief eulogy at the passing of these last representatives of an extinct race.

Vacuum tubes shared much of the warmth and weakness of our human species. The graceful outlines and egglike fragility of body — neither of us was likely to survive a fall down a flight of steps. The transparency — looking into a tube was like looking into the eyes of a human being — and neither of us was able to conceal for long if it was doing something spurious.

The little foibles — everyone knew that the 6146 had a delicate grid, and you didn't want to drive it too hard; and that the screen of an 807 was liable to melt if you tried to coax more power out of it that way; rather like we knew

about Uncle Chet's bad leg, and that you didn't want to mention the accident Aunt Lil had with the Buick.

Yes, tubes were like people, with names and personalities you could remember. The 6L6 was the little hardworking tough guy. He seemed to be everywhere, could do everything, and never gave up, even though his work came dirt cheap. We used him for oscillator, RF amp. modulator, and AF output. The 6V6 lost his job when the 6L6 showed up.

The tube complement of your receiver or transmitter were like members of your family — you knew all their names, jobs, and personalities. The 12AX7 speech-amp twins. The 6SK7 and 6AU6 — straight-arrow types; IF amps, they were. The big, brawny 5U4 rectifier — not a signal in his head, but boy, could he pump out the milliamps. And his little brother, the 5Y3 — always trying to be a 5U4, but never able to handle the current.

Many were the cold winter mornings when I would come into the lab with my hands wrapped around a hot cup of coffee, and huddle closer to the big Tek 551 oscilloscope for warmth. The tubes in there were happy to share

their body heat. And they achieved a splendid racial harmony — the blue mercury vapors; the orange regulators; the dark metal octals; the glass tubes, transparent with silver smears of "getter"; the green of the CRT trace.

Vacuum tubes were mortal — like us humans. Oh, you could run their filaments at double voltage for a minute or so to rejuvenate them into emitting electrons for a few more months — although there was always a risk of death inherent in such surgery — but you took them out of their sockets and put them through the tube tester with your own hands, and you knew that they would not be with you forever. And if a tube died a violent death, it screamed: It turned red in the plates, and choked blue with gas, and threw sparks, and pleaded for mercy.

A transistor, when it checks out, doesn't even drop off the key. It just leaves. No noise, no smoke, no smell—just gone. And if you drop a transistor down a flight of steps, the problem isn't breaking it—the problem is finding it. But you seldom make personal contact with an individual transistor or IC. They're all soldered in, and there isn't a "Transistors Tested Free" sign

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in the window of the local drug store, like there was for tubes in earlier days.

And even if they were in sockets, could you pull out and test all the ICs in your Pentiuch Byte Cruncher 8000? They're lined up in there in their hundreds, each one looking just like the next one, in chilling replication of the beetle helmets at a Nazi Nuremberg rally.

No, I can't let it happen. The semiconductor tyranny is not to be endured. A small band of partisans known as the AWA (Antique Wireless Association) is planning a strike in the 3,560 to 3,580 area on the last weekend in November [1998 - ed.], using 1929-vintage transmitters. I shall join the resistance movement. My pine breadboard, copper-strap coil, and CX-350 triode are hidden in my shack. On the appointed day, I shall assemble them into a Hartley oscillator, and a chirping signal generated by a single vacuum tube shall be heard calling CO CO de K8JWR. (See photos. — ed.)

That's wrong!

Teachers have a reputation for being notorious prigs, forever correcting the utterances of folks who were perfectly happy before they came along. This time, I intend to live up to my reputation by correcting some common abuses of technical language. Most of the following comes from IEC (International Electrotechnical Commission) publications, or the IEEE Dictionary of Terms.

Condensed. The thing formed of two metal plates separated by an insulator is now properly called a capacitor. The old word condenser is reserved for what you find on the back of a refrigerator. Automotive and electrician types may still use "condenser" for a while, but those days are numbered. And a capacitor has capacitance, not capacity. Capacity is the proper term for the ampere-hour rating of a battery. Finally, really small values of capacitance are expressed in picofarads (pF). Pico has the sound in peek, not the sound in pike.

Play a gig or dance a jig. The official pronunciation of the prefix for 1000 million is giga, with the soft G of

"jig." However, popular usage is so heavily in favor of the hard G (as in giggle) that we'll let you by on this one either way. We must insist that the prefix for 1,000 is abbreviated k (lower case), not K. The capital K is for the Kelvin, the metric temperature unit—and it is simply K: not °K or degree K. Note that computerists often use K to mean 1024, as in "300 Kbyte file." This is not recognized by the IEC, but is widely accepted.

Tongue twisters. The loopy pattern on an oscilloscope that shows frequency and phase relationships is a lissajous figure — pronounced leesah-joo, with no syllable accented. A crystal uses the piezoelectric effect — say pea-AY-zoh. Chassis is pronounced to rhyme with classy — the third S is silent.

Mystic symbols. The schematic symbol that looks like a garden rake represents a chassis or common connection: earth ground is the symbol that looks like an upside down Christmas tree, according to the IEC. So many people use the Christmas tree for chassis ground that we will have to wink at this one also. In schematics, wires crossing but not connected just simply cross — use no loops or humps to "jump" the wire. Where wires cross and connect, you should offset half of the vertical wire right or left a bit, and use two solder dots to show where the two vertical ends connect to the horizontal wire.

Grab bag. (1) ASCII stands for American Standard Code for Information Interchange, and is pronounced ASK-ee. The two letters I are not a roman numeral 2 — there is no two to it. (2) "Electronic" means "operated by currents flowing in a vacuum tube or semiconductor." "Electronics" means "having to do with electronic devices." Advertisers for an "electronic technician" are not looking for a human being, but a machine. (3) The letters dB have the character of a unit (like ampere, A) not a quantity (like current, I). Do not write dB = 20, but instead, with G for gain, write G = 20 dB. (4) We speak of a high-voltage device, but never of a high-amperage device; it is a high-current device. (5) Finally, my

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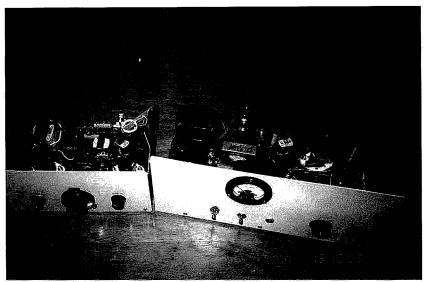


Photo A. The receiver at K8JWR consists of a type-27 triode regenerative detector and 27 audio amp. The transmitter uses a 27 Hartley oscillator and 27 neutralized amp at 4 watts output. The power supply uses a type-80 rectifier and VR-150 regulator. It's all built on pine boards with aluminum front panels.

personal pet peeve: Never talk of the "voltage going" to a device. Voltage causes current to go, but voltage does not go, flow, run, or move at all. Voltage "appears" or "exists" or "is measured." Say that it "goes" and I'll make you write on the blackboard 500 times, "Voltage doesn't go."

Resisting temptation

Every ham knows that l = E / R, but why call current I? Why not C? Well, I

hooked up with a French engineer on 40 meters a few nights ago, and he told me the French have two words for current. One is courrant (if I copied it right) and the other is intensitée. This is not strange — we have three words for E: electromotive force, potential difference, and voltage.

By the way, my Christmas [1998] stocking contained a copy of an 1871 text entitled *Modern Practice of the Electric Telegraph*, and Ohm's Law is given there as C = E / R. The Ohm at

that time was defined as the resistance of 1/16 mile of no. 9 galvanized iron wire, the standard in telegraph circuits. Incredibly, current and voltage were given no units at all throughout the 160-page text. The Ohm's Law problems start out, "Let the main batteries have an EMF of 1,000 ..." and end with, "... the strength of the current will be 15.4." These are obviously not volts and amps, but just arbitrary units.

Galvanometers were mentioned for comparing currents, but I don't think they had calibrated ammeters or voltmeters in 1871. It was not until the 1890s that the American Institute of Electrical Engineers and the International Electrical Congress got around to standardizing the units and terms that now — 100 years later — seem so familiar: volt, ohm, ampere, henry, farad, milli, kilo, and the lot.

Old-timers among us remember that hertz replaced cycle in our vocabulary about 1966, and that pico was stated micromicro or mickeymike until even later. And who could suppress a chuckle upon hearing that the unit of conductance (reciprocal resistance) was the mho (ohm spelled backwards) and that its symbol was an upside down "horseshoe" ohms sign (omega)? Now, alas, it is simply siemens, symbol S. Political correctness has driven out our sense of humor.

I consider it unfortunate that resistance was given substance with a unit before voltage and current, because resistance is the only one of the three that has no independent existence. Imagine that you get in a time machine and, going back to 1755, present Ben Franklin with a tiny cylinder with brown-black-red stripes on it. Could he call it a 1000-ohm resistor? No, it would only be a useless bit of carbon to him, because Volta would not invent the first source of continuous current until 1800, and Oerstead would not give us the beginnings of a current indicator until 1820.

Current has its own meaning as a flow of charge, and voltage has meaning as the "force" that moves the charge, but resistance has meaning only as a voltage/current ratio. As an analogy, what would it mean if you

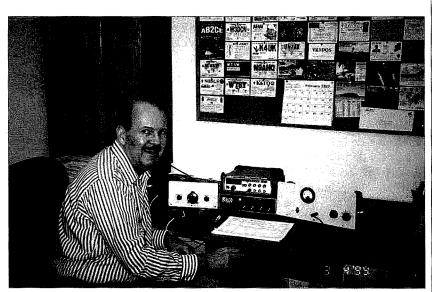


Photo B. K8JWR at the controls of his 1929-style station. Dan has now worked 36 states on 80 CW with this setup. (No, the frequency counter in the middle is not 1929 vintage.)

presented a Honda Civic to Robinson Crusoe and told him it got 40 miles to the gallon? Miles are real things, and gallons are real things, but fuel economy exists only as the ratio of these two things. With no gasoline and no roads, the term is meaningless. Without voltage and current, the term resistance is likewise, meaningless.

Notice that a Honda Civic is not 40 mpg; it is a machine that maintains a ratio of 40 miles to one gallon. Likewise, the brown-black-red thing is not 1000 ohms; it is a device that maintains a ratio of 1,000 volts per amp (or 1,000 mV per mA, to choose safer numbers). This conception of resistance as a voltage/current ratio becomes important when you have resistance without a physical device (antenna resistance, for example), and when the same device presents different resistance to DC than to AC — as transistors, diodes, and even simple coil wire are prone to do.

The lowly light bulb

Surely, in this age of high technology, there can't be much that we don't all know about a light bulb - or can there?

Thomas Edison invented the screwin base, and almost everything else about the modern light bulb except the filament material. He used carbonized thread, then carbonized splinters of bamboo. It was left to others to draw tungsten metal into a fine enough filament to be useful. A typical incandescent lamp operates with a filament temperature of 2,000 °C, where most metals would melt.

The resistance of a 100 W, 120 V lamp, by Ohm's Law, is $R = V^2/P =$ $120^{2}/100 = 144$, or about 150 ohms.

The resistance of metals increases with temperature, however, so a cold 100 W lamp will show a resistance of about one tenth that, or 15 ohms.

The steady-state current for the 100 W bulb will be 120 V/150 ohms, or 0.8 amps, but the inrush current, when you first turn it on and it hasn't had a chance to warm up, will be I = 120 V/ 15 ohms = 8 amps!

This inrush current will settle down to within 300% of the steady-state current in about 20 ms, and to 150% in 60 ms. Now, an ordinary fuse can withstand a 300% load current for about 0.5 seconds; a slow-blow type, for about 7 seconds. But fast-acting "instrument" fuses and certain types of magnetically operated circuit breakers may blow in as little as 10 milliseconds, so you can see that incandescent lamps in fused systems can get you into trouble.

Incandescent lamps may also draw huge current spikes upon burnout. You have probably seen the brilliant flash of light when you turn on a lamp and the filament parts. This is caused by ionization of the few gas molecules remaining in the bulb. Current through the ionized gas can exceed 100 A, and can last for several milliseconds. It can trip breakers and ruin diodes or triacs in the lamp's control circuits. A series resistor, calculated to drop about 5% of the line voltage, will limit ionization current to safe values.

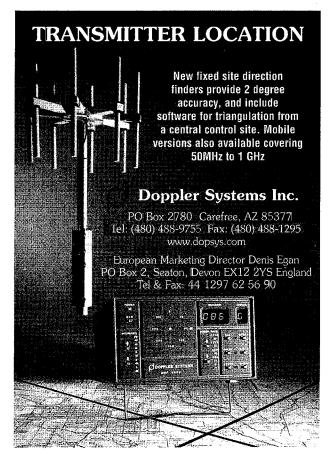
It has been found that incandescent

lamp light output varies as the 3.5 power of voltage, whereas lamp life varies as the 12th power of voltage. Using the y-tothe-x-power function of a scientific calculator, we see that dropping the voltage of a 120 V, 100 W lamp by 5% (to 114 V) will decrease the light output to 84%, but will give the lamp 1.8 times the life expectancy it has at 120 V.

Everyone knows that incandescent lamps put out heat as well as light, but what's the split? Sadly, only about 2% of the electrical energy delivered to an incandescent lamp appears as visible light. The other 98% is given off as waste heat — not too bad in February, when rooms need to be heated anyway. But in July, 1,000 W of incandescent lamps will require 3,600 BTU of air conditioning to remove waste heat.

Fluorescent lamps typically give 10% of their output as visible light, and only 90% as waste heat. This means you can use 200 W of fluorescent lighting to get the same brightness as 1,000 W of incandescent; you spend less on your lighting and on your air conditioning. High-pressure sodium lamps, used in street lights, give as much as 20% efficiency - still poor stuff for hams who are used to converting as much as 50% of their electrical energy to RF in their transmitters.

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Try This Tube-Type FM Transmitter

That's FM as in broadcast radio.

Once upon a time, when AM radio was king and TV and hi-fi were only dreams, a gadget called a wireless microphone was popular. You could use it to surprise the kids by telling them over the radio where their birthday presents were hidden, or to shake up a party with a bogus police call alarm for one of the guests.

But the most common application was for playing records through a radio without making connections to it. Times have changed. FM radio and hi-fi have made AM wireless mikes look like toys. The transmission range of AM mikes was limited, their signal was subject to interference, audio response was a joke, and they were frequency unstable. So, why not a wireless mike for FM radios, with all the familiar advantages of FM? Well, there's no reason at all why not!

Right up with the best-quality FM broadcast transmitters is this licensefree FM transmitter. With the exception of its low power output, its measured performance figures read like the spec sheet of a good professional FM transmitter. The quality of its transmission easily will match the capabilities of the best hi-fi system. By using temperature-compensating capacitors for C22, C23, C19, and C18, I found that transmitter drift was undetectable over a period of several days. With a sensitive FM tuner, its range is about 500 feet, and this is legal, too. Just look at what you can do with it:

• Wireless PA. Put a mike and the transmitter on a speaker's podium and

broadcast to an FM tuner connected to a remotely located PA amplifier to save yourself the trouble of stringing microphone wires. Overflow audiences in nearby rooms can hear the speech on an FM receiver or radio.

- Play records through FM receivers at different locations in your home.
- Use it as a baby sitter ("monitor") when visiting a neighbor.
- Use it as a low-power broadcast station at a school dormitory or at camp.
- Providing you really know how to use it and know how to service FM tuners, it's a good signal source for peaking the IFs of an FM tuner or radio.
- Use it to monitor communications of a communication radio at a remote location.
- Use its two-vacuum-tube design for experimentation.

As you can see, this preamp and FM transmitter has many uses, and a lot of features. There are high and low level input jacks which, in conjunction with selector switch S2, permit the use of a variety of program sources.

With S2 in the PHONO position, a magnetic cartridge with 2 mV output, connected to the low level input J1, will produce 100% modulation.

The AUX position of S2 provides R.I.A.A. equalization, which is accurate to within one percent from 20 Hz to 20 kHz.

When S2 is set to MIC, equalization is switched out, and J1's input impedance is changed from 47,000 ohms to 100,000 ohms. The 2 mV sensitivity is more than enough for a high impedance, low output mike. This 2 mV sensitivity is also sufficient for low impedance mikes, but a matching transformer should be used.

Connect high-output crystal mikes to high level input J2. At J2, the input impedance is 500,000 ohms, and there is a 20 dB attenuation. Program sources such as a preamp, or the preamp output of a tape recorder, also should be plugged into J2, and then S2 should be switched to the AUX position.

The audio frequency response of the FM transmitter is flat to within 1 dB from 50 Hz to 14 kHz. The transmitter signal incorporates the standard 70 μ S pre-emphasis.

In order to meet legal requirements for this type of transmitter, you must use the parts values specified and must not make any circuit changes. All parts were selected for physical size and electrical characteristics to

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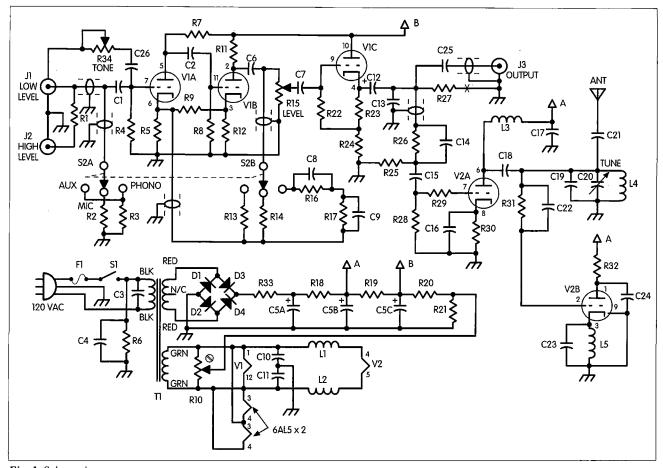


Fig. 1. Schematic.

ensure optimum performance, frequency stability, and legal output power. Where specified, temperature compensating or silver mica capacitors must be used: A ceramic disc will not do. Install all parts with particular care around V2, the modulator/oscillator tube. All leads must be kept as short as possible.

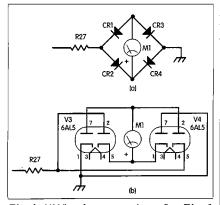


Fig. 2. VU/level meter options. See Fig. 1 for location of R27. For solid-state version in (a), use $100\mu A$ meter for M1.

Oscillator tank coil L4 is made with 5.5 turns of #16 enameled or formvar coated wire, wound on a 1/4" diameter rod spaced at 3/8" long. It is mounted on tuning capacitor C20, C19.

Use shielded cable, if possible, for the tube filaments. Run two cables, one for each side of the tube filaments, and ground both outside shields of the two cables. Do not use the chassis for one side of the filament circuit. Also note that the shield at one end only of each shielded lead (RG-174/U coax) is grounded.

After you're satisfied that all wiring is correct, turn on the transmitter, allow it to warm up for a few minutes, and attach a 7" piece of stiff wire to the antenna. The antenna must not be any longer than 7" (otherwise the radiated power will exceed the legal limits), and the transmitter frequency may be lower than 88 MHz. Adjust C20 so that its plates are half meshed. Tune an FM receiver or tuner between 88 and 90 MHz to find the transmitter signal. If

you can't pick up the signal, spread or compress L4 slightly until the signal comes in. Adjust RIO for lowest hum at the receiver.

On average program material, level control R15 should be set so that the meter indicates between 30% and 40%. A higher indication will cause distortion, because on audio peaks the bandwidth of the transmitted signal will exceed the bandwidth of the receiver.

Transmitter operation

V1A, V1B make up the audio preamp. Positive feedback from the cathode of V1A increases the audio gain. Negative feedback from the plate of V1B via C6 and S2B to the cathode of V1A reduces distortion and determines equalization. Switch S2A establishes input impedance.

Tube V1C drives the optional meter and modulator. The modulator/oscillator of the transmitter is a modified

Colpitts oscillator V2B. The capacitive voltage divider which appears in all basic Colpitts circuits isn't obvious at first. Here it is formed by V2B's grid-to-cathode capacitance, cathode-to-ground capacitance, and C23.

The circuit that determines the oscillator's frequency consists of oscillator tank coil L4, C19, C20, the interelectrode capacitances of V2B, the capacitance of V2A, and all stray wiring and antenna capacitances in parallel with L4.

Tube V2A (the left half of V2) is what is called a "reactance tube modulator." The characteristic of V2A in this circuit is that it can be made to appear as a capacitive or inductive reactance by changing the voltage on its grid. Since V2A is connected in parallel with the oscillator tank coil through C18, V2A's reactance change will vary the frequency of the oscillator above and below its center or resting frequency in step with the audio signal on V2A's grid.

The operation of reactance tube modulators and how they work can be found in the book *FM Simplified* by Milton S. Kiver. Also see *Principles of Frequency Modulation* by B.S. Camies, published by John F. Rider Publications.

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CIRCLE 36 ON READER SERVICE CARD

Parts List								
Part	Description	Part	Description					
C1	0.01 μF 50 V disc	R7	150 k					
C2, 7	0.02 μF 500 V disc	R9, 31	22 k					
C3, 4, 15, 17	0.01 μF 500 V disc	R10	250 Ω pot with screwdriver slot					
C5A, 5B, 5C	40/40/80 μF 350 V electro or individual caps	R13	68 k					
C6	0.05 μF 500 V disc	R15	1 meg audio taper pot with switch S1 (SPST)					
C8	1000 pF 500 V silver mica.	R16	4.7 megs					
C9	220 pF 500 V silver mica	R17	330 k					
C10, 11	0.001 μF 50 V disc	R18	1 k 1 W					
C12	2.2 μF 50 V electro	R19	2.2 k					
C13	0.002 μF 500 Vdisc	R21	3.9 k					
C14	1600 pF 500 V silver mica (1500 pF & 100 pF in parallel)	R23	680 Ω					
C16	470 pF 50 V disc	R24	10 k					
C18	47 pF 600 V temp compensation type N750	R25	6.2 k					
C19	2.2 pF 600 V temp compensation type NPO	R26	47 k					
C20	2.3 to 15 pF miniature variable (tuning)	R27	4.7 k					
C21	2.2 pF 500 V silver mica	R30	470 Ω					
C22	100 pF 600 V temp compensation type N750	R32	18 k 1 W					
C23	10 pF 600 V temp compensation type N750	R33	47 Ω					
C24	470 pF 500 V disc	R34	250 k pot					
C25	0.047 μF 50 V mylar	F.1	1/2 A 3AG fuse and holder					
C26	0.015 μF	S1	SPST switch on R15					
CR1-4	1N34A or 1N60 germanium signal	S2	2P3T rotary switch					
D1-4	1N4005 or bridge rectifier	L1-3	3.3 µH RF choke (J.W. Miller #70F336A1)					
All resistors 1/2	2 W 5% unless otherwise noted.	L4	Tank coil (see text)					
R1, 14	470 k	L5	1.5 μF RF choke (J.W. Miller 70F156A1)					
R2, 11	100 k	J1-3	RCA-type phone jack					
R3, 20	47 k	M1	VU meter or 50 μA meter (see text)					
R4, R8, R22	1.2 megs	Т1	Power transformer 117 VAC primary, with secondaries 250 VAC CT (not used) at 25 mA, 6.3 VAC at 1 A (Stancor #PS-8416)					
R5, 12, 29	1 k	, V1	6C10 tube					
R6, 28	1 meg	V2	6AQ8 tube or ECC85					

Table 1. Parts list. Parts can be obtained from Antique Electronic Supply, 6221 S. Maple Ave., Tempe AZ 85283.

Many people quit looking for work when they find a job.

Up on a Down Under Kit

The DSE K-7204 ESR/low ohms meter measures well on the 73 review-o-meter.

ESR stands for Equivalent Series Resistance and refers to the internal resistance in a capacitor. This becomes important when an electrolytic cap is used in a switch-mode power supply, a computer monitor, or similar equipment. As an electrolytic ages and perhaps dries out a bit, this resistance increases and the effectiveness of the capacitor decreases. Symptoms can vary from complete shutdown to overvoltage, and loss of signal quality. Just measuring the microfarads with a capacitance meter does not detect the problem.

For some time, I have been looking for a convenient way to check the ESR of capacitors. Basically, we need to measure the impedance using an AC voltage. One way of doing this would be to place the cap on the output of a signal generator and measure the voltage across it. This could then be compared to a known good capacitor of the same size, if one were available.

Or, we could calculate the impedance of a "perfect" capacitor at that frequency, then calculate the voltage that should appear across it when connected to the signal generator, and compare that with the voltage measured across the one being tested. Very time consuming and frustrating when troubleshooting a piece of equipment.

The best solution would be an AC ohmmeter able to measure down to hundredths of an ohm. That is what the Dick Smith Electronics K-7204 ESR meter is and does. And because it uses a very low voltage, it does not turn on semiconductor junctions, so the measurement can be made with the capacitor still in the circuit.

I have seen ESR meters advertised in the electronic magazines, but the prices were not inviting for the occasional user like myself. So when I visited the AnaTek Corporation's Web site and saw the Dick Smith ESR kit for only \$50, I decided to order one. I am glad I did. If you go to the Web site [www.anatekcorp.com], be sure to look at the Classified and Flea Market ads. There you will find the same item at a 10% discount.

The K-7204 kit is well designed and engineered. The circuit uses a programmed Zilog microcontroller along with 13 transistors and a TV crystal. A 4094 CMOS shift register drives two 7-segment 1/2" LED readouts. Ranging is done automatically from 0.01 to 99 ohms. Power is supplied by a 9 V battery, with a 78L05 regulator. Silkscreened on the panel is a table of the maximum acceptable ESR values. These values decrease with increasing capacitor size, and dip down and back up with increasing voltage rating. So the table is a convenient and necessary reference.

The 5-page assembly manual, although complete, is not a detailed step-by-step guide, like the old Heathkit manuals. It begins with a clear explanation of ESR and its causes, describes the meter and its operation, and then guides the builder in the wiring and

calibration of the meter. A 16-page *Guide* to *Kit Construction* offers the beginner proper techniques for construction and

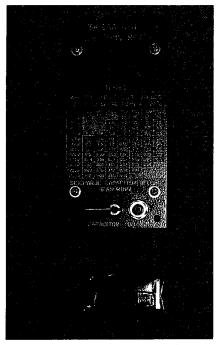


Photo A. The ESR meter accurately measures a low value resistor of 12 ohms. Silk-screened on the front panel is a table of maximum ESR values for electrolytic capacitors, for easy comparison with the meter reading.

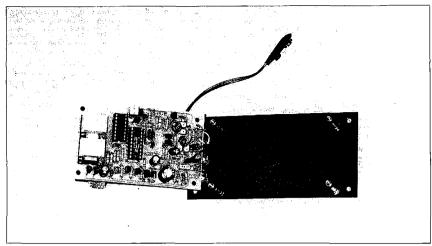


Photo B. The completed ESR meter ready for mounting in its case. The Zilog microprocessor appears in the middle of the PC board, next to the crystal. All components mount on this single-sided board except the 9-volt battery, switch, and test lead jacks.

component identification. Even so, I would not recommend this kit for a first-time project unless some supervision is available. My construction time was about two evenings from opening the box to the finished meter.

The quality of the kit and components is excellent. No parts were missing. Even the solder is included, A pre-tinned fiberglass printed circuit board holds all of the components except the test jacks and the on/off button. The finished board mounts on a pre-punched, painted, and silk-screened metal front panel. Calibration is quickly accomplished using supplied 1% resistors, after which the meter and 9 volt battery are housed in a black plastic case 1-5/8 x 2- $5/8 \times 5-1/4$ inches. The case is included. not an extra-cost item. Included also are a pair of regular test leads, plus a pair of banana plugs and alligator clips to make a set of clip-on test leads.

Operation is simplicity itself: Just one push-button controls everything. Pushed once to turn on, the display flashes "EA" and then shows a minus sign. Next, short the meter leads together and press the push-button again to cancel out their resistance. Put the leads on the capacitor, and the ESR is displayed in ohms. Push the button again to turn it off (or if not used for a few minutes, the ESR meter turns itself off). When the battery drops to 7 volts, a flashing "b" warns of the need for replacement. Besides measuring the ESR of capacitors. the low ohms ability of the meter makes it ideal for checking printed circuit traces and contacts. But keep in mind that the meter current is RF, so it will display the impedance rather than the DC resistance of wirewound resistors and coils.

I have not yet checked all of my electrolytics, but a number of those checked had to be discarded. I have also checked the in-circuit caps on a couple of computer monitors and several switching power supplies. A 47 µF capacitor in a nonworking power supply read 23 ohms ESR. Replacing it brought the supply back to life. My initial impression is that the smallersize caps of 10 µF and down are more prone to increased ESR.

The only real improvement I would suggest regarding this kit would be to have the parts values silk-screened on the PC board. This would speed construction and avoid parts placement errors. The addition of four rubber feet to the bottom of the case would help to keep the meter from sliding off the workbench. I added them shortly after picking up my 7204 from the floor of the workshop. The "drop test" confirmed that the meter is both lightweight and rugged. All in all, I recommend the K-7204 ESR meter both as an enjoyable construction project and as a practical troubleshooting tool — well worth the price. If you don't like to swing a soldering iron, a wired and tested version of the kit is available for \$99. But if you don't like to solder, you probably would not have much use for the ESR meter anyway.

For further information about the ESR/low ohms meter, contact Dick Smith Electronics, CNR Lane Cove & Waterloo Roads, North Ryde NSW 2113, Australia. In the USA, contact AnaTek Corporation, P.O. Box 1200, Amherst NH 03031; E-mail: [sales@ anatekcorp.com].

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DXpeditioning - Behind the Scenes, A smashing good book for DXers

Rare is the occasion when I encounter a ham-related text that is worthy of a cover-to-cover reading. A new book that has come out of the UK DX community is just that. DXpeditioning - Behind the Scenes, edited by veteran DXers Neville Cheadle G3NUG, and Steve Telenius-Lowe G4JVG, is a comprehensive reference for any would-be DXpeditioner that has not yet earned his or her stripes as one who goes wanting of that rare opportunity to "put a new one on" for the folks back home.

To better introduce the scope and intent of this book, here are Neville's own words to me in a letter that accompanied my copy of the text:

"We learned so much from the Spratly Island (9MØC) and other DXpeditions that we wanted to share these experiences with the worldwide DX community. The result is this wide-ranging manual which has been written by members of the 9MØC Spratly team. It is not only written for the DXpeditioner, there is also a great deal to interest all DXers. There is much in this book about operating standards. It also gives some idea of what is involved in providing several band-country slots on several modes from a rare location ... A wide range of topics is covered, including: Project Planning, Marketing and Public Relations, Licensing and Permits, Sponsorship, Preliminary Site Survey, Team and Management Structure, Equipment, Logistics, RF Matters, Technology, Propagation, Specialist Areas (RTTY, LF, 6 meters), DXpedition Manual, The Operation, Life Support and Environmental Considerations, Finance, After the Event, and QSLing. We believe that this book is a real "must" for all those interested in DXing. It has been published by RadioActive Publications of the UK and is available from Nevada Communications, Unit 1, Fitzherbert Spur, Farlington, Portsmouth, PO6 ITT, UK [www.nevada.co.uk].

Wayne Mills N7NG in his review commented "The well-crafted *DXpeditioning - Behind the Scenes*, offers a comprehensive view of virtually all aspects of a major expedition for the traveler and the DXer alike.

From early planning through QSLing, this book offers a variety of thoughts and suggestions on every facet of the DXpedition. It is by far, the most complete 'how-to' reference available.

We are forming a new DXpeditioning organization, the 'Five Star DXers Association' to take over the assets of the Spratly team. All the surpluses from sales of this book will flow to this new organization and will be used as part of the funding for a major DXpedition, probably to the Central Pacific in March 2001."

When I read through the biographical sketches of the contributors in the appendix (don't you all read back-to-front like I do?), I thought that this opus might be too UK-specific. But as I read on, it became clear to me that this book provides a systematic approach to DX project planning and resource management that may be applied to nearly every jurisdiction on the planet. I was also impressed with the way the 9MØC story is interwoven into the instructional material, providing some entertainment value for anyone who might find themselves tarrying among the pages. The pictures are cool, too.

Now maybe it's because my MBA is in project management, but I really appreciate the way Neville and Steve have not only given us a logical flow of planning and resource management, but have also provided some clues as to the true "critical path" in putting on a DXpedition on foreign soil. The context is, as Neville points out above, the lessons and experiences gained from 9MØC. Not only is the reader provided with

cogent explanations and clear examples, but excellent visual material as well. For example, Neville's figure on the page here shows detailed diagramming of just what needs to happen to get a DXpedition off the ground. Can you spell PERT?

Neville and Steve, modest gentlemen that they are, attempt to inform us that they merely acted as editors in the preparation of the material. While that may be true to a certain extent, the text bears evidence that they also developed a considerable amount of original material of their own. What remains apart from their own contributions is a collection of essays from various subject

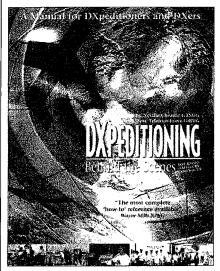


Photo A. Cover shot of DXpeditioning — Behind the Scenes, by Neville Cheadle G3NUG and Steve Telenius-Lowe G4JVG.





Photo B. Here are the two editors: Neville on the left, and Steve on the right.

matter experts in the UK DX community. Here is the list of chapter headings and authors included in the text:

- 1: INTRODUCTION Steve Telenius-Lowe G4JVG
- 2: PROJECT PLAN Neville Cheadle G3NUG
- 3: MARKETING AND PUBLIC RELA-TIONS - Ron Field G3XTT
- 4: LICENSING AND PERMITS -G4JVG
- 5: SPONSORSHIP G3NUG and G4JVG

- 6: PRELIMINARY SITE SURVEY -G3NUG
- 7: TEAM AND MANAGEMENT STRUCTURE - G3NUG
 - 8: EQUIPMENT Don Beattie G3OZF
 - 9: LOGISTICS G3NUG
- 10: RF MATTERS Tony Canning **GØOPB**
- 11: TECHNOLOGY John Linford G3WGV
 - 12: PROPAGATION G4JVG
- 13: SPECIALIST AREAS G3XTT and Mike Devereux G3SED
 - 14: DXPEDITION MANUAL G3WGV

- 15: THE OPERATION G3NUG
- 16: LIFE SUPPORT AND ENVIRON-MENTAL CONSIDERATIONS - G3NUG
 - 17: FINANCE G3WGV
 - 18: AFTER THE EVENT G3NUG
 - 19: QSLING Phil Whitchurch G3SWH
- THE SPRATLY ISLAND DXPEDITION STORY - 9MØC - G3NUG

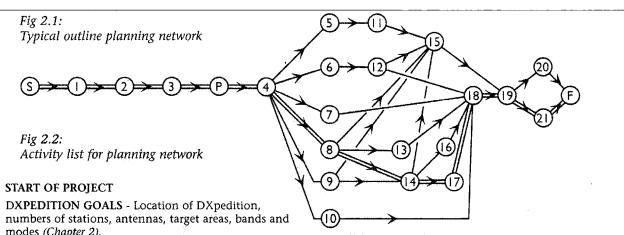
I should also add some kudos to the publisher, Radio Active Publications. I am very impressed with production of this book. The graphics are excellent and very clear. The general presentation is professional, and their employment of half tones and colors is superb as well. It is very refreshing to settle back with a publication in hand that is the antithesis of that which so often festoons the bookracks at the local radio store. Yes indeed, the publisher has done well by Neville and Steve.

I highly recommend this book to the readers of 73, and hope that it will find a permanent place in your libraries. Once again, here is where you may currently obtain a copy.

RadioActive Publications Nevada Communications Unit 1. Fitzherbert Spur Farlington, Portsmouth PO6 1TT, UK

[http://www.nevada.co.uk/book-dx.html].

I expect that it will soon be available locally. Cheers and a hearty well done, gents!



- modes (Chapter 2).
- SIZE AND SHAPE OF TEAM Numbers of operators, RF and technology support, experience and selection of core team (Chapter 7).
- OUTLINE BUDGET Costs and income required from team members, sponsorships and QSL cards (Chapter
- 11 SPONSORSHIP Initial sponsorship discussions with clubs, foundations, manufacturers and non-amateur sources (Chapter 5).
- 12 LOGISTICS: OPERATORS Detached planning, travel in and out, accommodation, time on site (Chapter 9).
- 13 LIFE SUPPORT Review all life support issues and
- Fig. 1. Here is a snapshot of some of the graphical details contained in the book (from page 7). (a) Typical outline planning network. (b) Example of activity list for planning network.
- 40 73 Amateur Radio Today September 2000

Central Arizona DX Association



N7KJ - 6545 East Montgomery Rd Cave Creek; Arizona 85331

Photo C. Logo of the Central Arizona DX Association.

The Central Arizona DX Association **Charter Member Reunion, Second Notice**

Here is a quick reminder to all of the "Diaspora" members of the Central Arizona DX Association. You may remember that I included a small feature on the 25th anniversary reunion of the charter membership of the CADXA in the July installment of the DX Forum. Well, the meeting is about to commence, so if you forgot, it's time to hit Pricewatch.com and book your tickets to Phoenix. The 25th Anniversary Reunion meeting will be conducted as part of the regular meeting of the Central Arizona DX Association on September 7th of this year. For those of you who are familiar with the area, it will be held at the PARA Club in Tempe. Anyone interested in attending, please contact Bob Davies K7BHM, CADXA Historian, at (480)839-3728, or via E-mail at [bdavies@sfarnipec.com]. Don't miss this very special event.

Kingman and Palmyra 2000

I just received this from Steve KF2TI a couple of days ago. Read on, this is important stuff.

Kingman Reef And Palmyra Atoll October

The Kingman Reef/Palmyra DX Group will operate from Kingman Reef in early October 2000. We need your financial support to make this very needed entity available to all DXers worldwide. Kingman Reef is number 16 overall and number 2 in EU-ROPE on the most recent ARRL DXCC "Most Wanted" list.

Our team is international in make up and highly experienced in operations from locations such as this, and their experience will enhance your chances of increasing not only your total count and but also many band/mode totals. Current team members are NI6T, N4XP, N4BQW, KH7U, NH6UY, K4UEE, WB4JTT, K3VN, DJ9ZB, AA7A, OH2BU, WA1S, and RA3AUU. Additional team members will be added for a total of 16 operators. Several of the operators have already operated from both Kingman Reef and Palmyra Atoll.

Operation will run for approximately 12 days in early October and will include 2 full weekends. Planned are 6 stations with amplifiers and yagis on higher bands, and a Titanex and Battle Creek Special on low bands. We will also operate 6 meters, RTTY and SAT. A web site will operate and N1DG is the web master.

KR/PDXG team members have been operating from Palmyra Atoll since early May as we assist The Natures Conservancy in establishing a base camp while the Conservancy completes the final stages of its purchase of Palmyra Atoll from its private owners. Operation from Palmyra will also occur as we stage and transit the atoll during the primary operation on Kingman Reef.

Donations are being solicited to offset the high cost of this type of operation. Please assist us in making this operation a success by donating any amount you can. If your donation is in the form of a check or money order, please make it out to "Kingman Reef/ Palmyra DX Group" and mail it to Tom

Continued on page 58

WANT TO LEARN CODE?

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Radio Direction Finding

Joe Moell P.E. KØOV P. O. Box 2508 Fullerton CA 92837 [Homingin@aol.com] [http://www.homingin.com]

Grunge Busters II — Intermod Patrol

Whether it's for exposing jammers, locating stations in distress, tracking endangered wildlife, promoting international radiosports or holding a friendly club competition, radio direction finding (RDF) is becoming popular among hams around the country. I've given talks about it to ten radio clubs so far this year, and there was lots of enthusiasm and interest among the members every time.

As I wait my turn to speak at these meetings, the "old business" topics often include members' complaints of noise and garbles on the club's repeater. followed by reports of the Technical Committee's efforts to find the cause. RDF is an important tool when the interference comes from a distant source, such as a spur-plagued pager transmitter, leaky cable TV coax, or faulty medical telemetry device. Two of last year's most popular "Homing In" columns were in the March and June issues, where the repeater grunge-busting efforts of RDF enthusiasts in New Jersey and California were described.

Sometimes, no one else is to blame because the grunge originates right at the repeater site. The culprit might be inside the transmitter final stage, inside the receiver front end, or somewhere else close by. You might think these problems would be easier to solve than distant spurs, but the presence of the strong repeater signal can actually make it much harder. In such cases, RDF can help put the pieces of the puzzle together, as this month's tale illustrates.

Aerospace agony

Over a hundred big-gun DXers and VHF-FM enthusiasts coexisted peacefully at the southern California engineering facility where I worked fifteen years ago. In addition to a world-class HF station with a Collins 13-element log-periodic beam for 40 through 10 meters on a 90-foot tower, the shack housed the first two-meter repeater to be put on the air by an aerospace industry ham club.

Shortly after the club installed a higher repeater antenna, a problem arose. Every evening, the repeater would begin transmitting a howling sound and some muffled

scratching noises. Sometimes the noise would just break in and out intermittently. At other times, it was so severe that it would hold up the repeater until it timed out. As soon as someone keyed up the repeater again, the cycle would begin anew. Heavy rain would make the problem go away for a day or so, but then it would come right back.

Carrier access for open repeaters was the norm in southern California at that time. No one considered putting full-time subaudible tone access on their machines. Besides, that would only have covered up the problem. The grunge would still have QRMed weak signals.

Audio howl and lockup of the repeater were clues that intermodulation was involved. This phenomenon, usually called "intermod" for short, occurs when two or more signals on different frequencies interact to produce signals on additional frequencies that are related mathematically to the original signals.

This interaction happens normally inside receivers. For instance, when you listen to an FM broadcast station on 91.5 MHz, a local oscillator in your radio is generating an unmodulated signal on 102.2 MHz, from which the 91.5 MHz signal is subtracted to produce the 10.7 MHz intermediate frequency. The subtraction takes place in a nonlinear stage called a mixer. In a good receiver, all other mixing products (such as the 91.5 + 102.2 MHz sum) are filtered out. The mixer is the only non-linear stage in the set.

If mixing takes place where it shouldn't, unwanted intermodulation interference occurs. Transmitter finals and receiver inputs are supposed to be linear, but sometimes improper tuning or incorrect device bias conditions will introduce non-linearities.

The result can be very serious. An example is the case in Ohio some years ago in which a strong signal from a TV broadcast transmitter went down the coax into the final stage of an FM broadcast transmitter at the same site. Intermodulation products were created and amplified in the FM transmitter, then radiated to cause widespread interference.

When nonlinearity produces harmonics as well as sum/difference products, many more unwanted frequencies can be generated. For instance, here's what could happen if repeaters on 146.79(-) and 147.39(+) shared the same site and severe intermod occurred:

(2 X 146.79) - 147.39 = 146.19 MHz (2 X 147.39) - 146.79 = 147.99 MHz

 $(3 \times 146.79) - (2 \times 147.39) = 145.59$ MHz

(3 X 147.39) - (2 X 146.79) = 148.59 MHz

...and so forth

Any of these products could cause unwanted QRM if radiated. Even at very low level, the 146.19 product would lock up or severely desensitize the 146.79 repeater.

Now back to the aerospace story: From the audio howl and lock up of the repeater, it was clear that our transmitter output was mixing with another signal (or signals) to create a spur on the input frequency. But what other transmitters were involved? Where was the mixing taking place? Usually when two signals mix in this manner, you can hear the audio of both at the same time, so why not in this case?

Our club's repeater was on 146.97(-). A few minutes with a calculator showed that signals or harmonics of signals on 147.57, 146.67, 147.27 and some out-of-band VHF

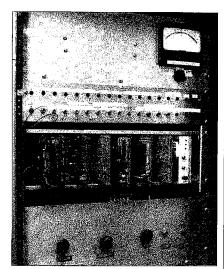


Photo A. This two-meter repeater was built from the ground up by aerospace hams about 25 years ago. The receiver Smeter tap connects to the panel meter at upper right.

frequencies could mix with the fundamental or harmonics of 146.97 to produce a signal on the input. But signals on these frequencies weren't strong, weren't continuous, and weren't dead carriers.

Careful checks with a dummy load and spectrum analyzer showed that there were no spurs from the transmitter on or near 146.37 MHz. The receiver antenna had to be picking it up from an external source. Perhaps RDF could be used to detect and locate the mix signal. With the transmitter locked on and the repeater howling away, I drove slowly through all parking lots of the 300-acre facility, trying in vain to pick up a signal on the input with my 4-element RDF quad. No luck.

Schmoozing the guards

Apparently, I needed to get the RDF gear closer to the repeater. A visit to the Security office and some fast talking produced a letter of permission to bring my vehicle inside the facility gates. Nobody told the Security officers, however. As I drove up and stopped right in front of the gate in my car bristling with antennas, I think it was instinct that made the guard's hand move toward his weapon.

After some more fast talking, I got the car and gear inside, where the grunge remained elusive. Using a sideband detector1 for maximum RDF system sensitivity, I found that the only traces of 146.37 signal were coming from the direction of the ham club's station on a building rooftop. The signal got slightly stronger as I drove to the side of the building under those antennas. But was that weak carrier really the grunge signal, or was it just a birdie in my receiver caused by the very close and strong signal on the output?

My conclusion from the RDF experiment was that the grunge was coming from something in the club's hamshack or its antenna system. Unlike the hilltop communication sites occupied by many ham repeaters, our radio room was quite "clean" at the time. The only system in 24-hour operation was the repeater. The company's two-way equipment and the club's packet cluster station hadn't been added to the room yet. The rooftop had only the repeater antenna mast and the large log-periodic HF antenna on its

I stopped the howling lockup temporarily by putting a 10 dB RF attenuator between the duplexer and the receiver input. For a few days I ruminated about the "scratchy" characteristics of the grunge and how it seemed to change suddenly (for better or worse), around sunrise and sunset each day. Maybe the spur was not made up of mixed narrowband FM signals.

If one signal were FM broadcast, the wideband modulation (±75 kHz deviation) might sound like that on a narrowband (± 5 kHz) FM receiver. I took out the RF attenuation, opened the receiver squelch, and strained my ears to try to get some intelligence out of the scratchy grunge. Hmmm, this isn't music. It sounds like somebody talking, and talking, and talking.

In those pre-Rush days, there was only one talk-radio station in the Los Angeles market. It was an AM station on 790 kHz. Could that be it? I couldn't imagine how a 790 kHz signal could lock up a two-meter repeater with intermodulation.

How could I clearly copy AM signals coming through a narrowband FM repeater receiver? I could tap the IF and feed it to an AM receiver tuned to the IF frequency, but I didn't have a suitable receiver for that. So I tried something more crude. The repeater receiver had an S-meter output, consisting of a diode detector on a second-IF stage, wired to a meter on the system panel (Photo A).

That diode ought to be a rudimentary AM detector. I hooked an audio amplifier and speaker to the S-meter output. Voila! The sound of not just one, but two AM broadcast stations came plainly from the speaker. Quick comparisons with a pocket transistor radio verified that one was on 790 kHz and the other was on 1390 kHz.

Now the mix equation was obvious:

$$146.97 - 1.39 + 0.79 = 146.37 \text{ MHz}$$

It was also evident why the grunge made sudden changes at sunrise and sunset. That's when many AM broadcast stations daily change their directional antenna pattern and/ or power output. But it still didn't explain where the mix was taking place and why

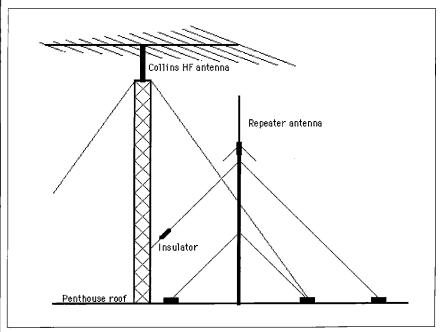


Fig. 1. The tall HF antenna tower and repeater antenna masts were quite close and they used some of the same guy anchor points. Adding an insulator in one guy wire solved a pesky intermod problem, as the text explains.

CALENDAR EVENTS

Listings are free of charge as space permits. Please send us your Calendar Event two months in advance of the issue you want it to appear in. For example, if you want it to appear in the December issue, we should receive it by September 30. Provide a clear, concise summary of the essential details about your Calendar Event.

SEPT 8-9

QUEEN WILHELMINA STATE PARK, AR The 31st annual Mena Hamfest will be sponsored by the Queen Wilhelmina Hamfest Assn. at Queen Wilhelmina State Park near Mena AR. The location is 13 miles west of Mena AR on Hwy. 88. Talk-in on the Quachita ARA rptr., N4EJZ, 146.79 100 Hz tone, or 146.49 simplex. For flea market spaces, contact Charlotte KC5DOR at (870) 642-7656, or E-mail [blee@ipa.net]. This family oriented state park features a zoo, miniature golf, scenic railroad, and snack bar. RV and tent camping as well as lodge. No entrance fee, but \$2 registration quarantees next year's flyer.

SEPT 10

BETHPAGE, NY The Long Island Hamfair & Electronics Flea Market will be sponsored by LIMARC, Sunday, Sept. 10th, 8:30 a.m.-2 p.m., rain or shine, at Briarcliffe College, 1055 Stewart Ave., in Bethpage NY. Amateur radio equipment, shortwave radios, scanners, CB equipment, power supplies, accessories, ARRL info, and the all new 50/50. Tailgate spaces \$15. General admission \$6, children under 12 free. For more info, call the 24-hour LIMARC info line at (516) 520-9311, or check the Web page at [www.limarc.org]. Talk-in on the 146.850 PL-136.5 rptr.

SOUTH DARTMOUTH, MA The Southeastern Massachusetts ARA, Inc. will hold its annual fleamarket on the club's grounds at 54 Donald St., South Dartmouth MA. The event will run from 9 a.m. to 1 p.m. Talk-in on 147.00/.60. Admission \$2, spouse and children free. Walk-in VE exams at 10 a.m. Free space for vendors. For further info contact Bill Miller K1IBR at (508) 996-2969: or by E-mail to [billmiller@netzero.net].

SEPT 16

FORESTDALE, RI The Rhode Island Amateur FM Repeater Service, Inc., will operate the 146.76, 146.94, 223.76, and 447.425 repeaters in Rhode Island, and will hold their annual Spring Flea Market and Auction at the VFW Post 6342, Main St., Forestdale (No. Smithfield), RI. Take the Forestdale exit off Route 146 in No. Smithfield, take a left at the end of the ramp and go six tenths of a mile to the Post on your right just before the Village Haven Restaurant. Please observe parking instructions. Flea market opens about 8 a.m.

Spaces are \$5 each. Some spaces are available under the pavilion on a first-come first-served basis. An auction will be held from 11 a.m. until about 3 p.m. Talk-in on 146.76. For further info contact Rick Fairweather K1KYI, 106 Chaplin St., Pawtucket RI 02861. Tel. (401) 725-7507 between 7 and 8 p.m. only. E-mail to [k1kyi@arrl.net].

SANTA ROSA, CA The Sonoma County Radio Amateurs, Inc. Annual Hamfest and VE exams will be held at Lewis Adult Education Center, comer of Lewis Road & Lomitas Ave. Vendors admitted at 6:30 a.m., buyers 7:30 a.m. Double parking spaces for vendors at \$10 each, buyers free. VE exams 9 a.m.—12 noon. For info and directions call *Rick Reiner K6ZWB at (707) 575-4455*, or go to the Web site at [http://www.cds1.net/scra/]; or write to SCRA, P.O. Box 116. Santa Rosa CA 95402.

WHITE PLAINS, NY The Hudson Division Convention, sponsored by the Westchester Emergency Communications Assn., will be held at the Westchester County Center in White Plains NY, Directions: Interstate I-287 in Westchester to Exit 5, east on Route 119 to the County Center on left, Doors open 8 a.m.-2 p.m. Features include forums, VE exams from 8:30-11:30, many ARRL officials, commercial vendors and a large flea market. There will be no tailgating. Tables are \$25. Vendors will be admitted at 6 a.m. For more info call the WECA hotline at (914) 741-6606; or go to [www. hudsonconvention.org]. Talk-in on 147.06 PL 114.8. There will be a convention dinner on Friday, Sept. 15th at the Elks Lodge in New Rochelle. Three awards will be given for Grand Ole Ham, Technical Excellence Award, and Amateur Radio Operator of the Year.

SEPT 21

NEWTOWN, CT The Western CT Hamfest will be held at the Edmond Town Hall, Rt. 6, from 9 a.m.–2 p.m. Setup at 7 a.m. Exit 10 on I-84. Talk-in on 146.67(-) PL 100. New equipment dealers, flea market, tailgating, computers. Tables \$10. Tailgating \$6 (each includes 1 admission). Admission \$4 (under 12 free). Reservations and info to Seab Lyon AA1MY, 12 Willow St., Beacon NY 12508.

SEPT 23

BENTONVILLE, AR The Benton County Radio Operators will host a hamfest at the National Guard Armory from 8 a.m. to 1 p.m.

Talk-in on 145.290 rptr. Contact Shirley KC5RDU on the 147.030 rptr. for further info; or E-mail [SRHarris@ipa.net].

SEPT 24

NEW PORT RICHEY, FL The 10th Pasco County Hamfest will be held 9 a.m.—3 p.m. at New Port Richey Recreational Center, 6630 Van Buren Rd., New Port Richey FL. The event will be inside and air conditioned. Admission \$5, XYLs and under 12 admitted free. Tables \$15 each; electricity \$5. Tailgate spaces \$3 each. Contact Ron Wright N9EE, 8849 Gum Tree Ave., New Port Richey FL 34653. Tel. (727) 376-6575; or E-mail [n9ee@akos.net].

YONKERS, NY The Metro 70cm Network will hold a Computer and Electronic Fleamarket at Lincoln High School, Kneeland Ave., Yonkers NY. Doors open for vendors at 7 a.m. and buyers at 9 a.m. Free parking. Admittance \$6; under 12 years free. Talk-in on 440.425 PL 156.7; 146.910 PL 114. Vendors should call N2VQP after 7 p.m. at (914) 969-7888; or E-mall [Ceve914@aol.com] to register.

OCT 8

MEDINA, OH Join the M2M Group for the all new 2000 Medina County Hamfest, Sunday, Oct. 8th, at the Medina County National Guard Armory, 920 W. Lafayette Rd., 1/2 mile west of the fairgrounds. Vendor setup at 6:30 a.m. Open to the public 8 a.m.-2 p.m. Talk-in on 147.030(+). Computer equipment, new and used ham gear, VE exams, contact Fred at (440) 236-3477. Walk-ins always welcome. Indoor tables. Limited outdoor flea market spots available on a first-come first-served basis. General admission \$5 per person at the door or \$4 in advance. Vendors \$9 in advance, \$10 per table on the day of the event. For more information about tickets and registration, please call Mike at (330) 273-1519.

WALLINGFORD, CT The 8th Nutmeg Hamfest & Computer Show, and the ARRL Connecticut State Convention, will be held Sunday, Oct. 8th, 9 a.m.-3 p.m. at the Mountainside Special Event Facility, High Hill Rd., Wallingford CT. Exit 15 Rte 91 (North or South). Follow signs. Vendor setup starts at 6 a.m. Some of the features of this event are: Indoor and outdoor vendors and private "tailgating" sales, seminars, lectures,

ABOUE & BEYOND

VHF and Above Operation

C. L. Houghton WB6IGP San Diego Microwave Group 6345 Badger Lake Ave. San Diego CA 92119 Ichoudh@pacbell.netl

The Joy of HTs and Other Transceivers for VHF/UHF

I have had so much fun over the years using and carrying HTs for various bands, starting with an early two-channel FM crystal-controlled HT many years ago. Back then, this was quite a jump in technology, as it replaced a single-channel crystal-controlled hand-held unit that had a suit-case handle on top of the unit to carry this transceiver. (It was a converted surplus Motorola business-band FM transceiver.) We paid quite a bit for premium multichannel (usually two channels) crystal radios in those days.

Well, it took quite a few years until the Icom IC-2AT came upon the HT scene, and what a development that was. As far as I was concerned, this was a marvel in technology, sporting a synthesizer and CTCSS tones and touchtone for phone patch use — all off the HT touchtone pad. You can't imagine what a commotion it caused when it was introduced.

I don't have the old IC-2AT now, as it was passed off to a good friend. I've added many other fine HTs to the test-and-use grist mill over all these years. They include HTs for bands from 144 MHz, 220 MHz, and 440 MHz.

The 2AT has been upgraded to an 1C-02, and added to this collection which includes an IC-03 and an IC-04 to cover all bands from 2 meters to 450 MHz. I even have an HT (Santec LS-202) that sports SSB and FM all rolled into one compact unit. The Santec has proven to be quite a valuable HT, especially when my interests include microwave portable operation. It beats carrying a base station multimode radio for field operation in the ARRL 10 GHz and Up contest each year. It just depends on your style in setting up at a remote location, be it a secluded spot or a more comfortable one that permits much larger installations. If you have to back-pack or work on a limited-weight-tocarry operation, the Santec LS-202 for SSB operation is most necessary, and weighs in at only about a pound, batteries included.

You might ask yourself, "Why so many radios?" Well, It started out being an evaluation to find the best devices to be able to modify and turn into usable microwave

converter "IF" strips for converters. In the beginning, I picked up what I could find in the used market, and from there it just developed into what it is today. Still, it's a collection amassed hit-or-miss, but still remaining in operating condition, attesting to a very good workbench and maintenance routine for those who needed it. The rest of the units have stood the test of time and still function without anything except a good dusting off once in a while.

What, then, makes a very good base station for microwave converter operation? Popular applications demand a multimode radio for CW, SSB, and narrowband FM. My multimode collection, amassed over the years in trying to find the best possible microwave converter radio, includes the Kenwood TS-700, the Icom-202, Icom-211. Icom-245, Icom-260, and my main base station, an Icom-820. All these radios are capable of multimode operation, with the exception of the Icom-202, which is SSB only. All are desirable for microwave converter IF usage in either the 2 meter or 3/4 meter frequency range. In the used marketplace, all except the Icom-820 are in the \$100 to \$200 swap meet price range. The Icom-820 would be a great find, but is still too new a radio to be found at swap meets or the used market at a lower range bargain

If you're interested in a multimode radio for VHF / UHF work or microwave converter usage, pick up what you can. If you pass up a bargain-priced radio, waiting for the ideal radio to come along, you might have a long wait. My recommendation is to

pick up what you can locate and start operating, getting your feet wet in this fascinating part of the hobby, be it SSB or converter usage. Still, keep an eye open for your best choice, and upgrade later should you find a better multimode radio.

Most of the HTs in my collection are Icom radios. It just happened that way and has worked out well, proving rugged construction and quality give little trouble over many years of use. In retrospect, I was swept off my feet with that first 2-channel 2 meter FM HT so many years ago. With the first synthesized 2 meter radio — the Icom 2AT — it happened again! A great technological advancement that could not be passed up. Recently, it happened again with my latest acquisition.

Now, I don't go out and purchase every model of radio that comes along, but sooner or later there is a device that comes along that really catches my eye. This HT that caught my eye is also an Icom radio, and sports a four-band transmit and six-band receiver. As an amateur transceiver, the IC-T81A produces 5 watts output on 50 MHz, 144 MHz, and 450 MHz, and 1 watt on 1296 MHz. Its mode of operation is all narrowband FM, except for the VHF aircraft band on 118 to 135.995 MHz which is AM for this receive application. Wideband FM is put into play for receive frequencies of 76 to 107.995 MHz.

All other operation is on the four amateur bands, narrowband FM 50-54 MHz, 144-148 MHz, 430-450 MHz, and 1240-1300 MHz. Wide receiver coverage extends operation from 74 to 174 MHz on VHF, 400

to 470 MHz on UHF, and 1240 to 1300 MHz on the UHF microwave band. Operation is from either a cable to external source of 12 volts DC, or an internal NiMH 9.6 volt 680 mA internal battery pack.

The Icom-T81A sports a single rubber ducky antenna suitable for use on all of the four transmit frequencies, 50 MHz to 1300 MHz. Icom updated its antenna connector to a miniature SMA microwave connector instead of the BNC connector on earlier radios. This change to the SMA connector represents a great improvement that is more sturdy regarding external connection or antenna movement. This has been a problem with most HTs equipped with BNC connectors, with movement of the antenna stressing the chassis-mounted BNC connector. The addition of this SMA microwave connector makes great sense for operation in a miniature microwave connector. It's great having such a small connector on the end of the mobile cable, instead of the PL-259-to-BNC adapters that are mandated in other units.

I have been so impressed with the Icom-T81A HT that I have many plans for its use in my main interest of microwave converter usage. One drawback for microwave converters and IF radios for 2 meters is that your image frequency can still have some influence in your converter's output, as it is only 150 some MHz away from the carrier. Realizing that, microwave filters for 5 GHz or 10 GHz can have a usable passband of a few hundred MHz, allowing the image of the 2 meter radio to still have some degradation of system performance.

The easy way around this problem is to

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Photo A. The Icom IC-T81A four-band HT for 6 meters, 2 meters, 3/4 meter, and 23cm.

use a higher IF frequency, pushing the image over the filter's passband rejection slope and solving this problem (by using 1296 MHz or some other frequency in the 1240 to 1300 MHz range of operation available with the Icom T81A). This would be all narrowband FM of course — wish it could be SSB also, maybe in some future model!

In its operation, the Icom T81A is just a breath of fresh air, it is so easy to use. I find in Icom's advertisement that you don't need the manual to remember all of the functions, as it's quite easy with the joystick button and simpler keypad operation. I have to agree with Icom that this HT is quite easy to operate. I find that while I don't do the correct option key stroke function every time from memory, it is usually thought out in a few seconds and then correctly implemented. On other HTs, I have struggled without the instruction manual and find this T-81A is so much improved that I can't shout loud enough about how great an improvement it is.

In brief, it's just much easier than other HT's I have tried, eliminating the struggle to remember the functions of the keypad and trying to remember the correct programming options. As with everything, nothing is perfect, and the only problem I find is the front panel joystick button going into SET MODE. It functions well for four of its five functions, so it's not a great liability, just a minor annoyance.

The joystick button is a multifunction button that normally works very well for four functions — the up, down, left, and right selections. It's quite easy to remember what function is what, as it displays the selection process on the LCD display, somewhat eliminating carrying a pocket cheat card. The fifth function is "SET MODE", accessed by pushing straight down on the joy button for a 1 second duration. I find you have to attempt this function a few times before entering the SET MODE. What you get sometimes is one of the other four functions coming up vs. the desired SET MODE. A minor inconvenience. Just use this button with a sensitive touch and the problem seems to go away. If you persist in being heavyhanded, it will give you some difficulty.

Now, don't take my comments about this as a major fault. I find the entire package of the Icom-T81A to have so many positive attributes that I tend to forget about this SET MODE problem. A simple fix for those who might want to load up quite a few repeaters and tone functions is to obtain the PC-programmable software and the connecting cable and do all programming of memory and options using the software. For spur-of-the-

moment programming, it just takes a small amount of trying to accomplish the SET MODE programming desired. As I mentioned earlier, if you don't know what repeater tones are required, the T81A has a tone scan mode that is easily accessed. When the unknown tone is decoded, the SET MODE contents are programmed with the desired decoded tone frequency. Quite a nice internal tool.

For those who plan travel with an HT, I recommend the PC Windows program and computer interface cable that allows you to program in spreadsheet fashion and then upload to your T-81A. In this way, you can save files for different parts of the country and options that are functional for different regions you plan to visit. You could set up repeaters for the Dayton area for use there and when you return home you could upload your local systems, returning the programming from a saved PC file of your local systems. This makes the T-81A very versatile and quite easy to use.

Other options available include auto shutdown, saving battery power when not used; LCD backlight lighting; beep tones for keyboard control; auto repeater duplex or simplex frequency controls; DTMF dialing speed; and LCD contrast controls. Standard "SET MODE" contents include CTCSS tone use for squelch operation; repeater tone frequency setting; tuning steps for frequency tuning; repeater offset frequency desired; scan resume conditions; and a toggle to enable or disable "RIT/VXO" frequency function on the 1200 MHz band only. Other operations using the Icom-T81A include AM operation on the commercial aircraft band, and wideband FM in the 88 to 108 MHz band.

All the features rolled into one very small package that fits nicely in the palm of your hand. Ergonomically speaking, Icom has designed a great HT into a very small package - battery included, with a four-frequency antenna. I especially like the size and power-to-weight ratio for power output of 5 watts in high power mode, making it very nice in mobile use. That's where I get the best enjoyment from the T-81A, as I park my truck in the downtown area of San Diego and do not want to have an underdash or other radio showing to tempt someone to break into my vehicle. I figure it's easier to eliminate the problem by not displaying some candy in the open for a potential problem. That's of course my preference, to use HTs for mobile use to eliminate the auto break-in side of the problem.

Accessories in my operation include a

Mobile, Portable and Emergency Operation

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Justifying Our Existence

Far too many of us are old enough to remember Walt Kelly's comic strip, "Pogo." In one famous episode, a character parodied Commodore Oliver Hazard Perry's report of victory ("We have met the enemy and they are ours"). In the comic strip, the character stated, "We have met the enemy and they is us."

At times, this is a far too accurate state ment about some of the practitioners of ham radio. Many times, when we are doing good things, some hams seem bent on ensuring that we do not get the credit we are due. These folks are so intent on enforcing the letter of the law that they are oblivious to the spirit of the law and totally unaware of the spirit of the hobby.

In the past few months, hams have done yeoman duty helping out in wildfires in the southeast, southwest, and northwest. They have provided key communications for a young man who was injured when his family's boat was attacked in the Caribbean. Hams have been the communications for public service events; through SkyWarn, the eyes and ears of the Weather Service; and the link for local emergency relief efforts. They routinely provide all kinds of support for their communities.

In some respects, we do not expect to receive credit for the work we do, but in others that credit is a critical component of our existence. Bluntly put, how can we possibly justify the existence of a hobby that has access to broad expanses of the radio spectrum? Why do regulations such as PRB-1 exist? Why does the FCC invest its time and effort into maintaining our existence? The reason is simple - we currently offer a value to the community that is greater than the cost we represent to the government. However, merely representing a great value to our community and our nation is not sufficient — we must also make key people aware of what we do represent.

Value is one of those concepts that we think we understand, but about which we may be hazy. There's an old saying that a cynic knows the price of everything but the value of nothing. Unfortunately, there appears to be more than a few cynics within the ham radio community.

What would it cost to assemble a group of experienced radio operators on short notice, equip each of them with one or more radios, and dispatch them to the scene of a disaster? If this had to be done by a local government agency through normal channels, you would see at least the following:

- 1. Radio equipment, \$200-\$1000
- 2. Radio operator, \$10-\$15 per hour
- 3. Benefits, 20%-40% of hourly rate

In a relatively small operation involving five radio operators for a single eight-hour day, we would be talking about the following:

- 1. Radio equipment (minimum), \$200 times five operators = \$1000
- 2. Salaries and benefits (minimum), \$10 per hour times eight hours times five operators = \$400, plus 20% for minimum benefits = \$480

Of course, to maintain a team of professional communicators would require additional costs. In the hospital where I work, an individual who is not guaranteed a certain amount of hours each week is paid a premium rate when they are needed. In addition, those who are subject to being called in to work on short notice receive a small hourly amount just to be available. There might be some type of additional pay for being sent to a disaster area, and of course any time over eight hours would be paid at time and a half for overtime. So, no matter how you slice it, five amateur radio operators who volunteer their time and equipment for public service represent hundreds if not thousands of dollars in value.

Unfortunately, we hams sometimes forget how much we contribute to the common good and how this must, and in fact does, represent a value to the community. Now, to get a real feel for how extensive this is, remember that during any given week there are hams providing support for hundreds of

locations throughout the country. For argument's sake, let's figure that there are one hundred events at which ham radio is active.

- 1. 100 events which utilize five amateurs for a total of eight hours = \$48,000
- 2. Equipment for five amateurs at each of the one hundred events = \$100,000

If we look at one year's activity, assuming that we have only one hundred events per week, which use only five hams for one full day, the value of the labor is \$2,496,000 and the equipment value is \$5,200,000. In reality, the number of hours hams provide is probably much, much higher for real events without counting various drills, emergency nets, support of MARS, etc. If that is the value of the service we provide, what is the cost?

Zero.

Nothing.

Nada.

On the surface, this looks like one heck of a deal for the government, but on the other hand, it explains why the government is willing to give us our frequencies and tolerate our towers, etc. This is a good deal both for us as hams and for the government — the proverbial win-win arrangement.

Why have I bored you with these calculations? Recently I read some E-mail regarding a public service exercise in which Ron Wetjen WD4AHZ used the format from the ARRL Public Activity Service Report (FSD-157) to indicate the value of service which amateurs had provided. Since he had assigned a dollar value to the service provided, several folks responded as to how this was in violation of Part 97. In fact, no money ever changed hands, so there was neither a violation nor any impropriety. On the other

Y2K Field Day Report

The ARRL (American Radio Relay League) Field Day competition offers an opportunity to test emergency preparedness communications and, for the satellite enthusiast, the challenge of making hamsat contacts from a remote location. Field Day is always the fourth weekend in June, and Field Day 2000 was great.

The object of the competition is to work as many stations as possible on any and all amateur bands. This includes HF, VHF, UHF and the microwave bands, with the exception of 30, 17 and 12 meters. There are also a number of activities that an individual or group can pursue to collect bonus points. One of them is 100 extra points for a satellite contact.

While most clubs just want a single 100-point satellite QSO, there is an alternative Field Day competition that shares many ARRL rules, but is separate and focuses only on satellite operation. It is run by AMSAT, the Radio Amateur Satellite Corporation. The goal is to make as many satellite contacts as possible on any and all hamsats. Any mode that will work via satellite is encouraged and each satellite is considered a separate band.

Unlike normal shortwave operation in a remote location, more preparation is needed for satellite work. The communications equipment and antennas must be checked for even minor problems, since the received

signals are very often weak and transponder loading is at its peak during the contest. If the Field Day site is far from home, orbital predictions must be recalculated for a different location, especially if beams are used.

Field Day 2000 via satellite

Last year AMSAT-OSCAR-10 was surprisingly good and this year was nearly the same, but this 17-year-old hamsat can be quite unpredictable since the onboard computer gave out over a decade ago. AO-10 provided many voice and CW contacts for those who pursued it, and with its high elliptical orbit, AO-10 is still a great resource in the sky. It is simply an uncontrolled, but functional Mode "B" (70 cm up and two meters down), transponder in space.

The Fuji satellites F-O-20 and F-O-29 were both in analog (voice and CW) mode for Field Day. Contacts were plentiful for those who were prepared for the exceptional Doppler shift associated with satellites

with a UHF downlink. The 70-cm downlink signals can drift as much as 20 kHz in the course of an overhead pass. Satellite newcomers had problems keeping up.

The Russian RS-13 hamsat did well, but operation via this VHF/HF hamsat was confusing. RS-13 is currently in Mode KA. This means that it receives on two meters and 15 meters simultaneously and downlinks on 10 meters. Due to the great band conditions on 15 meters, numerous stations that were simply working terrestrial 15-meter Field Day, were heard through the transponder. While this was entertaining, it made it very hard to tell the difference between satellite stations and those that were inadvertently being heard through the satellite.

Operation via AMSAT-OSCAR-27 and UoSAT-OSCAR-14 was as expected, super crowded! These single-channel FM Mode "J" (2 meters up and 70 cm down) repeaters in the sky were working well even though it sounded like hundreds of stations

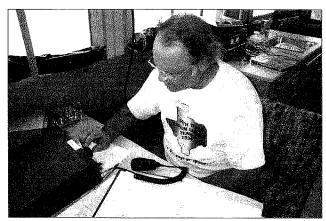


Photo A. Mike WA5TWT gets serious with AO-10 during Field Day 2000 at W5ACM in South Texas, on the Sparks Ranch west of Houston.



Photo B. Yaesu FT-847s were used for both HF and satellite use during Field Day at W5ACM.

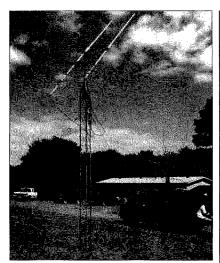


Photo C. Borrowed satellite antennas and tower, from Doug WB5TKI, worked well for all of the VHF/UHF hamsats during Field Day 2000.

HAMSATS

continued from page 48

were trying to access the satellite simultaneously. Perhaps the mass of signals is like that heard by shuttle astronauts when they operated SAREX (the Shuttle Amateur Radio EXperiment). The result is that only a few contacts are made, usually by the stations with the biggest antennas and the strongest transmitters. It was wild, but at least it was only temporary. Unfortunately there were a number of stations trying to get their 100-point ARRL Field Day bonus using HTs and small beams. Most were disappointed, but what can you expect from a repeater with an altitude of several hundred miles, when everyone within range is trying to talk at the same time?

available for Field Day last year, it was on for some passes over the U.S. this time. During one pass over North America it was operating like a 1200-baud packet digipeater on Mode B (70 cm up and two meters down). On another pass, SO-35 came over in FM voice mode. It was fantastic. Very few Field Day participants expected SO-35 to even be on the air for Field Day due to satellite overheating problems caused by excessive sun exposure. For those who were checking the two-meter downlink frequency on each pass, it was a delightful surprise to get some digital and FM voice activity for the competition. The FM downlink on 145.825 MHz is always easy copy, even on a small scanner or HT.

The digital hamsats were doing reasonably well this year. Three 9600-baud birds were the most popular; UoSAT-OSCAR-22, KITSAT-OSCAR-23 and KITSAT-OS-CAR-25. Downloading and uploading Field Day greeting messages is an accepted activity in the AMSAT Field Day rules. Recent rule changes also allowed digital contacts that use the amateur-radio satellites as flying digipeaters.

Several stations tried out the 9600-baud satellites using the Kenwood TMD-700A this year. Results with this new, rather amazing mobile transceiver were mixed at our site. We had a few too many cables and connectors between the radio and the antennas, thus only a few Field Day messages were downloaded, due to low received signal levels. Communication with the TNC (Terminal Node Controller) in the TMD-700A was easy to set up and use, but next year we will do a few tests before heading to the field with a new system.

Field Day 2000 - terrestrial

Our group of satellite chasers had pro-While SUNSAT-OSCAR-35 was not | vided the hamsat station for the Texas DX Society for a number of years. This year TDXS decided not to do Field Day, so we were on our own. Our primary HF Field Day antenna, a three-element triband Yagi, had been collecting dust in an attic. Fortunately the elements and hardware had been carefully packed and labeled. Assembly was easy, and the large beam with rotator was actually lighter than the satellite array with its tower sections.

Two Yaesu FT-847s were used for all SSB voice and CW contacts at the main station. an air-conditioned pop-up camper. One rig was used for satellite and the other for HF. The radios did both tasks quite well. With emphasis on satellite work, the HF station was simply for fun, and if necessary, to provide backup gear for the satellite system. After fighting for contacts via AO-10 and its deep, long signal fades, 20-meter phone seemed loud and easy, but extremely crowded. The old beam did a great job though, and was also quite useful for the RS-13 downlink passband on 10 meters.

Six meters was a surprising delight this year. Coverage was very similar to ten meters and signals were very good on the MFJ transceiver and small three-element beam at 12 feet. Most of our contacts from south Texas were into the northeast around Tennessee, although a few got as far north as Canada, and south to Florida. The station was set up in the open, and the Texas mosquitos were fierce after dark.

Field Day 2001

While there are no guarantees that AO-10 will still be on the air for Field Day next year, there are also no promises about HF propagation. We hope that both will be in good shape. We are also hoping for a fully commissioned Phase-3D satellite to be online for the event. Will you be ready?

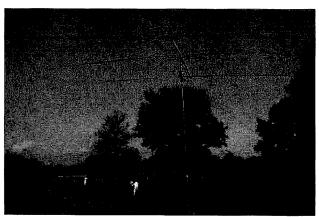


Photo D. A typical Texas Field Day site — cows check out the HF antenna installation.



Photo E. Ed KD5ELB ran the six-meter outdoor station at W5ACM during Field Day.

Jack Heller KB7NO P.O. Box 1792 Carson City NV 89702-1792 [jheller@sierra.net]

DigiPan is as easy as PSK31 gets

You may wonder why DigiPan appears to dominate the new as well as the serious PSK users as their choice software. There are several good reasons. I went back to the web site (See **Table 1**) and downloaded Version 1.2 to upgrade Version 1 that I tried some months ago, and discovered why so many hams are hooked.

First — It is easy. Easy to get (down load it free). Easy to install — I haven't heard a ham say it took more than a few minutes after the download until the program displayed on their monitor.

Configuration is a snap — The pull-down menu under "Configure" includes a simple three-entry box for your callsign, name and QTH. If you are using a PTT switch, click on the serial port option under "Configure" and define your port and the pin you are using in the port connector. The author recommends to use a PTT switch and gives the simple circuit in the help file. It is the standard circuit I use — it works.

Instructions for cables — The help file will lead you step-by-step to "wiring" the audio from your radio to your computer soundcard. The only extra information you will need will be about the pins on the connectors of your radio. This can be found in your owner's manual.

Set the audio level — I got a pleasant surprise when I clicked "Spectrum drive" and "Transmitter drive" buttons under "Configure." When you do this, the "Volume control" panel comes up automatically for your soundcard. With other programs, I have always had to wrestle the volume control panel up from the Windows™ Control Panel, and devise a procedure to keep the volume controls displayed while putting the program in the transmit mode. This all works so easily with DigiPan, it seems too good to be true.

The bottom line — I didn't have to stop to make any cables because the same cables work for most of the soundcard programs (now that DigiPan allows the use of the DTR pin in the serial port for PTT). DigiPan macros are partially defined for you so you can easily make contacts without typing in callsigns. Attempting to remember the other

ham's call does slow you down on the typing end.

Macros are in place for you to call CQ. call another station who was calling CQ, initiate an exchange ([his call] de [your call]), turn it back to him (BTU, etc.), and sign off. There is an added plus to pre-defined macros. You can see what is written already and the editing becomes a cinch. In other words, I like to send three lines with a CQ. All I had to do was right-click the macro button for CQ and add what I wanted, which included the instruction to go back to receive.

I did a little experimenting to see what would happen if I double-clicked a call sign in the receive field. Sure enough, it copied the callsign into the "Call" box above the field. The same thing worked with "Name" (for the other ham) and "Report" received. Using this little bit of knowledge, I was able to make the first contact with the upgraded software within 15 minutes of the download. That spells easy to me.

Afterward, I spent a little more time browsing the help menu and found instructions to automatically place information in the remaining boxes from the receive field. See Fig. 1.

Also, in the Help file, there are instructions to alter the frequency markings above the tuning field. The program comes with some generic numbers which you can alter through the configure process to read very close to the actual frequency you are tuned to. With a little practice, you will be able to speak in Hz instead of meters. Small revision to our methods, but some of us like to be a bit more precise.

The program is equipped with an easy to use log. Clicking the "Save" button at the upper right of the screen saves the information in the cells. There are help file

instructions for printing and exporting, plus you can search and view on the screen for previous contacts.

This version of DigiPan is the third release. I don't know if there is another release immediately in the works, but there isn't much left to fix. The authors, Nick UT2UZ and Skip KH6TY have added features and removed bugs until this is a very complete package.

Incidentally, Nick is the author of the MixW multi-mode shareware program that provides a choice of tuning methods and does RTTY and packet. Additionally, it contains two new modes, MTTY and FSK31, that you will be hearing more about as time moves on. However, if you want a program to join in the fun of PSK31 and presently have no intentions of working other digital modes, you can't lose with DigiPan. It just simply works and is as easy as it can be made. Plus, once you have the DigiPan working the way you want, the same cable setup will work for MixW, as well as quite a few other pieces of digital software.

If you haven't tried this mode, you can make a few sound cables (to get the audio back and forth between the computer and your rig), for \$10 to \$20 at the high end. It is not necessary to build the PTT circuit in the beginning. You can put the program in transmit mode and manually toggle the transceiver. It is a few extra strokes, but quite a few of us have started that way with great success. The quality of the signal is the same and most PSK hams know to wait a bit after a turnover ... just because.

The popularity of PSK

I was noticing the other evening, about supper time, how busy the PSK portion of 20 meters was. Usually I can call a station and they hear me and we can have a decent rag-chew. This particular evening there was such an abundance of activity that we were all victims of each other's QRM. This does not happen every evening, but it is a sign of the times. This mode has really caught on.

Other new modes

Along that same line of thought, I see several new modes coming along that may share and add to the impact. There is another factor I have noticed that is something to be thankful for: that is the influx of licensed hams into the HF spectrum since the middle of April.

Back to the new modes. We have used or heard of MT63 and Hellschreiber, though I still think of the latter as a novelty. There are some new offerings that are just getting going due to the fact there are so few hams with the necessary software. Nick's MixW now includes the FSK31 and the MTTY.

Both modes carry the claim of narrower spectrum use and added stability. I haven't

been in the right place at the right time as of this writing, but it will be very interesting to use these modes and get real feedback from other users. I believe the MTTY can be narrowed to less than 50 Hz between the tones. I am not sure if the FSK can get much narrower than the PSK's 31 Hz. Time will tell how well these modes are accepted.

There is one more, and I have only heard the results of an initial test QSO that was successful between Europe and Australia. The mode is named Piccolo and is authored by Nino, the author of the popular soundcard programs, Hellschreiber and MT63. It is reasonable to believe that by the time this hits print, there will be advances in all these three new offerings.

TrueTTY update

A while back, I wrote a piece about a nice shareware package by Sergei UA9OSV, and mentioned there were some changes he was working on. Well folks, Sergei has been

Web address (URL): Source for: Mix W Soundcard program for PSK31, RTTY, http://tav.kiev.ua/~nick/my_ham_soft.htm http://users.nais.com/~jaffejim/mixwpage.htm new modes, MTTY, FSK31, more TrueTTY - Sound card RTTY w/ PSK31 www.dxsoft.com/mitrttv.htm Pasokon SSTV programs & hardware www.uitranet.com/~sstv/lite.html PSK31 - Free - and much PSK info http://aintel.bi.ehu.es/psk31.html Site with links to PSK31 and Logger 7. Also www.chronidenetworks.com/~dwm/Logger.htm Zakanaka and scope program PSKGNR — Front end for PSK31 www.al-willlams.com/wd5gnr/pskgnr.htm Digipan - PSK31 - easy to use - new version http://members.home.com/hteller/digipan/ TAPR - Lots of info www.tapr.org TNC to radio wiring help http://freeweb.pdq.net/medcaif/ztx/ ChromaPIX and ChromaSound DSP software www.siticonpixets.com Timewave DSP & AEA products www.timewave.com Auto tuner and other kits www.ldgelectronics.com XPWare - TNC software with sample DL www.goodnet.com/~gjohnson http://home.t-online.de/home/di4rck/ RCKRtty Windows program with free DL [use lowercase DL4RCK] http://home.att.net/~k7szt/ HF serial modern plans & RTTY & Pactor SV2AGW free Win95 programs www.raag.org/index1.htm Source for BayPac BP-2M & APRS www.tigertronics.com/ BayCom - German site www.baycom.de/ BayCom 1.5 and Manual.zip in English www.cs.wvu.edu/-acm/gopher/Software/baycom/ N1RCT site - excellent RTTY ref. http://www.megalink.net/~n1rct/ Int'l Visual Communication Assn. — nonprofit www.mindspring.com/~sstv/ org. dedicated to SSTV Creative Services Software www.cssincorp.com Hellschreiber & MT63 www.freeweb.org/varle/ninopo/iz8bly/index.htm

Table 1. The chart from Hell(er) — your guide to good things on the Web.

busy. The one change I was looking for was the one to make my typing look better, the over-the-air backspace. He did it. I just got the recent update and, sure enough, that little item is included along with quite a few others.

TrueTTY does PSK31 and RTTY. In addition to the backspace for PSK31. Sergei has included quite a few improvements to the operation of the entire program. He has made it easier to set the UTC time as it relates to local time.

He has also improved the editing capability of the macros, which can now be edited from an "edit macros" menu as opposed to editing a page containing all macros, such as with a text editor. There are many other improvements to the program that, if you haven't looked in for a while, you will be surprised at what you see.

Printers are getting better and different — I recently got one of the HP color printers that prints near-photo-quality images. I checked first to see if there were ink refills available as there were for the old printer. There are and they are also available for the color cartridges. What a deal, I thought.

There is a little surprise I should tell you about when refill time comes. The aftermarket ink package comes with a humongous paper clip, with instructions to clamp it on the cartridge early in the refill process and to take it off when finished. They also have some dialogue concerning leaks.

There is a definite connection. The clamp (and this is not explained) is to squeeze in the sides of the cartridge being filled and sealed so there will be a minute vacuum after the fill hole is plugged and the clamp removed. They mention the amount of ink may be more than is needed. Sure enough, I got a leak from the discharge area.

This is probably adding up to you as you read this. I think next time I will squeeze the sides a bit more aggressively and not fill the cartridge absolutely full. It looks to be education by the seat of the pants. The cost savings is substantial, so I will continue to do this, but it is a learning experience. If yours leaks, put it over a container and let it leak. Wipe it occasionally so the ink doesn't dry. My first one took the better part of an hour before it looked safe to install, but it works great.

Then I discovered something about the complaint on Internet Explorer — I have used Netscape from day one and just recently purchased a little accounting package from MicrosoftTM to help me communicate with my accountant. Installation did not go well.

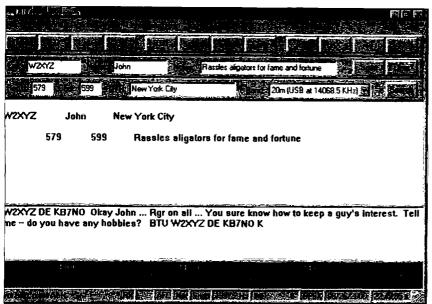


Fig. 1. Screenshot — Here is a shot of the program "everybody is using," Version 1.2 of DigiPan. The macro buttons at the top can either be clicked with a mouse, or you can use function keys to activate the macro. As a demo, I typed the bits of info in the receive field, then double clicked the callsign which was copied into the "Call" cell. The same was done with the John and the 579. For the other entries, it was necessary to select, click and drag per the help file info. In the transmit field, the two callsign exchanges were entered by using the pre-defined macros. The position of the diamond in the tuning screen at the bottom can show the frequency in use if you tune your radio to the frequency in the "Band" cell at the top. Hidden behind the "always on top" icons (from unrelated software) at the top, is your station callsign; as soon as you configure the free DigiPan software.

The package included the Internet Explorer browser and it was required, otherwise the little 20 to 30 megabyte accounting package would not play. To install the whole shebang required 175 Megs! I rebelled. Actually, the computer wasn't in the correct mode. The drive is partitioned and the major part of the program had to be installed where I had the least room - or else. A call to Microsoft didn't offer a cure, only confirmed the waste of space was part of the process. I decided to scrap the software from the world leader and go buy something from a slightly less egotistical organization. No wonder all the accusations and court proceedings. Hard to believe until you see it first hand. Not much ham software would be sold if programmers used such tactics. There would never have been a PSK31 revolution.

Another look at an intense programming effort for computer control of your transceiver and attendant accessories may offer some interest to you. Some time back, I was made aware of [http://www.trx-manager.com/], which displays a shareware program for control of most popular transceivers. The first time I accessed the URL I happened on the French version and didn't fare well.

The other day I gave it another stab, and there is an English version that the above URL takes you to. If you are curious and would like to see such a program work in your shack, you can download a full working version with a limited trial period. I gave it a try. It worked on my new rig, which indicates they are

keeping the software updated. I haven't formed an opinion of its true value to me, but it is worth a look if you have a computer and a transceiver. They give a lot of help and hints for what to do when things don't work, so you should be able to make it do its stuff.

If you have questions or comments about this column, E-mail me [jheller @ sierra.net]. I will gladly share what I

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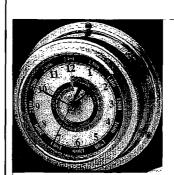
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Inside Digital TV/VCR Tuners

Part 1: How to make them work.

TV tuners have been around for a long time and have really helped hams with numerous projects. The early TV tuners used tuning capacitors and/or variable inductors for channel selection and were later replaced by detent and switchable tuners. Although these tuners worked well in ham projects, the real breakthrough came with the varactor tuners that opened up a whole new world for ham exploration.

The more recent introduction (about 1995) of digital tuners changed the way tuners performed in both TV and VCR applications by increasing tuning stability. Digital tuners are now beginning to find their way to curbside trash bins, where hams are encountering them for perhaps the first time. My introduction to digital tuners began when Pete Haas N8PIF, sent me a tuner and requested information on how to use it. Unfortunately, at the time I knew perhaps less than anyone about them. However, having the tuner in-hand was very compelling, and the information provided in this series on tuners is the result of my study.

While we're on the subject of giving credit to those who have made this

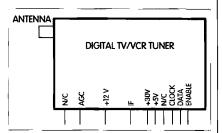


Fig. 1. Typical 3-wire digital tuner is shown. A 2-wire tuner appears to be similar but minus the enable input.

study possible, David Shalita W6MIK followed along very closely with me as the study moved forward. David built up a data test set similar to mine, which will be described later, so that we could work essentially in parallel. Having David work with me was similar to having help pulling up on one's own boot straps. But with help, of course, you gain ground, and we did, as you'll see reported here.

My thanks goes out to both Pete and David for their support in bringing this digital tuner project to an experimenter's beginning. With the digital tuner door opened, only experimentation will tell us how far we might go. If you have an interest in tuners, then please follow along, as this is an exciting technical adventure. It was a tremendous learning experience for me. As you'll see, I'm NOT a digitally oriented person, but I've gained a new perspective on the field.

Digital tuners

There are essentially two types of digital tuners at this point, classed as 3-wire and as 2-wire. Digital tuners, as shown in **Fig. 1**, look very similar to the more common varactor tuner. I'll

describe the 2-wire first so that we'll be able to spend the rest of the time on the 3-wire tuner.

The 2-wire tuner is the latest entry into the tuner stable, and because of the technology used, it will most likely be around for a long time. Control of the tuner is via separate data and clock lines, and follows an adopted computer protocol (reference Philips Semiconductor's application note AN 036) called I2C, which is a two-way, two-line communication bus between a microprocessor and peripheral ICs. In the case of a 2-wire digital TV/VCR tuner, the internal synthesizer has a unique address, and when addressed by a microprocessor/controller, the synthesizer will acknowledge and then be enabled to receive data via the data bus. From that point on, the tuner provides all of the normal tuner activities such as receiving a signal at a given frequency, and then generates an output signal that is passed along to the rest of the receiver.

The 3-wire bus system used in TV/VCR tuners is the subject of information to be provided in this series. Although the 3-wire tuners are compatible for I2C control via the CLOCK

and DATA bus, the ENABLE bus must be kept separate because the 3-wire tuner does not have a unique internal address.

3-wire data requirements

Those 3-wire tuners that I've encountered to date require that 18/19 bits of data be clocked serially into the internal register of a synthesizer IC. For the register to recognize and prepare for the receipt of data, an ENABLE line must be raised before and during and then dropped at the completion of the data transfer as shown in Fig. 2. Following the first falling edge of the clock pulse after the drop of the ENABLE line, data will be transferred from the receiving register to the appropriate functions within the tuner.

The first four bits clocked into the register are band bits, which are essentially pass-through data that is used to enable the internal tuner band selectors (diode switches). Following the band bits in sequence are 14 or 15 frequencyselect bits that are used to set up the synthesizer divider chain. These bits are in binary order with the MSD (most significant digit) bit being the first clocked in and the LSD (least significant digit) bit being the last. Some synthesizer registers will transfer the frequency data following the 19th clock bit should there be a data overrun. However, other tuners will fail to realize that the data has been overrun. and will ignore the entire entry. When an 18-bit count is used, many synthesizers will reset the first MSD (bit 15) frequency bit to zero while a 19-bit clock keeps bit 15 active. Any clock speed below 100 kHz is accepted by the synthesizer register, making it easy for manual data entry.

Data bits in the serial bit stream are given a binary weight, with bit 15 being equal to 16,384, bit 14 equal to 8,192, etc., down to bit 1, which is equal to one.

Voltage requirements for digital tuners appear to be quite uniform for all of those that I've encountered — including the I2C variety. The voltages are as follows: +12 V, +5 V, and +3O V. Maximum tuner sensitivity occurs with an AGC voltage between (+)6 V and 9 V.

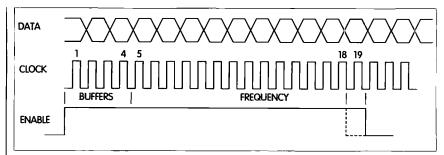


Fig. 2. 18/19-bit bus timing diagram for a 3-wire digital tuner.

Controlling the tuner is a matter of generating a serial bit stream that will select the desired frequency band within the tuner and then set up the synthesizer divider to the proper count. Determining the divider count is fairly straightforward and can be done with a pencil and paper, a calculator, or a computer. I've worked up a BASIC program to do the counting following the entry of a desired frequency. The BASIC program will be discussed later on, for those interested in using such a tool. I'll also show you how to easily work out the binary coding using the pencil and paper method.

After going through all of the above information, you may wonder why anyone would bother with a digital tuner. That's a good question that can be answered only by each individual. For me, the challenge of making the digital tuner operate was my reason for proceeding. Now that the digital tuner is operating, it has many of the same applications of the earlier varactor tuner.

Perhaps the best feature of the digital tuner is the frequency stability of the local oscillator (VCO). Being phase-locked, the local oscillator is as stable as the 4 MHz crystal that's used within the synthesizer. Defining all of the

possible uses for the tuner is a little difficult at this point, because only time and experimentation will provide the answer. However, the positive features involve frequency stability while monitoring a received signal, the input frequency is a "known" because of synthesizer control, and the tuner should make a useful and very stable synthesized signal source.

The front end design of the digital tuner incorporates a dual-gate FET, which allows it to have perhaps the best possible input sensitivity. During my tests, the input sensitivity has been as good as the receiver that followed the tuner. In some cases, the tuner provided an increase in input sensitivity. As an example, if the basic receiver exhibited an input sensitivity of 1 μ V, the use of the tuner allowed the sensitivity to remain at 1 μ V, and in some cases it improved to almost 0.5 μ V.

Perhaps, on the negative side, the digital tuner might not be a good candidate as the front end of a spectrum analyzer project because of the synthesizer step frequency. Unlike an analog varactor tuned tuner, which can be tuned smoothly from one frequency to another, a synthesized tuner will step

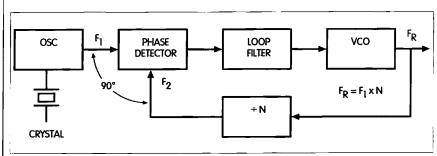


Fig. 3. Block diagram of a basic phase-locked loop synthesizer.

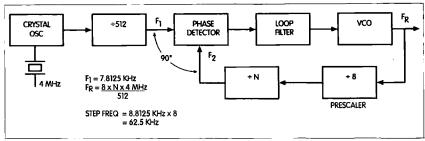


Fig. 4. Typical TV/VCR digital tuner synthesizer. Tuner step frequency is 62.5 kHz.

Inside Digital TV/VCR Tuners continued from page 55

from one frequency to the next as the tuner moves across a frequency band.

Synthesizer theory

*Before getting into the details of how the digital tuner is controlled, it is desirable to review how synthesizers operate, because that's the basis upon which a digital tuner operates. The objective is to understand how a synthesizer is used to control the local oscillator (VCO) within the tuner through the use of a numerical divider.

Frequency synthesizers get their name from being able to generate a great number of discrete frequencies with the same stability as that of a quartz crystal, while utilizing only one crystal. Fig. 3 shows the basic elements of a phase-locked synthesizer where the VCO is locked to the stability of the crystal, but can operate at any frequency that can be locked by the loop. When the VCO is "locked," the two input signals to the phase detector are

equal in frequency, but operating in quadrature (90 degrees apart).

As long as the phase angle remains, the system operates OK, but if the phase shift changes between Fl and F2, then the VCO begins to move until either phase lock is again achieved or the VCO falls to a low preset outof-lock frequency. In most cases, the phase detector will develop a DC output voltage sufficient to steer the VCO back into lock with crystal.

Normally, the frequency of FI, at the input of the phase detector, is a small value and determines the

step frequency of the synthesizer. It is also used to calculate Fr (VCO output) when the loop divider is known. As an example, if Fl = 1 MHz and the divider is 10, then Fr = 10 MHz. A loop filter is used to reduce the VCO's rate of change so that "hunting" is eliminated.

A digital TV/VCR tuner synthesizer, as shown in **Fig. 4**, follows the theory described, but has two additional divider elements that modify the calculation. A prescaler (divide-by-8) is typically used between the VCO and the synthesizer divider. The purpose of the prescaler is to reduce the input frequency to the main divider because of the divider's low frequency response and the limited divide ratio that's available. The prescaler's fixed divide ratio has a direct effect on the final synthesizer step frequency.

Between the crystal oscillator and the phase detector is an additional divider that reduces the crystal frequency to a low value. As shown, the divider has a divide ratio of 512, which reduces the 4 MHz crystal frequency to 7.8125 kHz (FI). With both fixed dividers in place, the equation for determining the step frequency is 7.8125 kHz x 8 = 62.5 kHz.

When stepping across the TV spectrum, a step frequency of 62.5 kHz is quite logical, but the step is pretty drastic for some ham applications. However, the wide step doesn't daunt a ham experimenter, because tuning across the tuner's IF output band with a receiver resolves the issue.

What's to follow

This is the first in a series of seven discussions on digital TV/VCR tuners. In this first section, we've discussed the different types of digital tuners and the frequency synthesizers used in the tuners, and have provided some insight into the calculations needed for digital tuner control.

The second part in the series will discuss the data transmitter that may be used for tuner control. Additional sections will include a data receiver, testing of the digital tuner, a BASIC program for generating the binary code, and a discussion on making printed circuit boards for a digital tuner project.



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Windshield Auto-Wiper

This gadget provides an interesting approach to an old challenge.

Auto-Wiper, an off-on device intermittent windshield-wiper controller, evolved as a solution to the shortcomings of conventional controllers. Built around the ubiquitous 555 timer/oscillator chip and a handful of discrete components, it offers some unusual features not found in most commercial units.

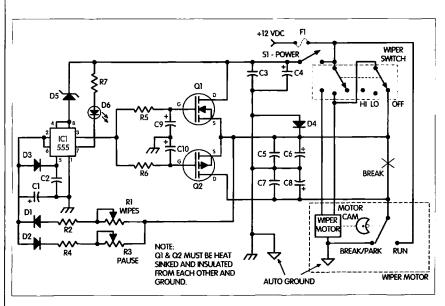
onventional SCR controllers use the wiper motor internal cam switch to commute (turn off) the SCR as the wiper motor cam rotates out of its detent. The electrical power to complete the wipe cycle flows through the cam park switch and the wiper switch until the cam once more rotates into detent, interrupting the power source to the motor. After a pause, the SCR is again pulsed "on" to repeat its single cycle again. This approach to control is called open-loop (no feedback), single-cycle operation.

In most SCR wiper controllers, the system continues to operate as long as the wiper switch is turned on and power is applied to the circuit. And although most can be slowed down (for a very light rain), many cannot be made to automatically perform one "pass" and then "pause" for any appreciable amount of time. To create such a pause requires operation of the wiper switch. This may mean that the wipers stop at any place along the wiper arc and at the park position (where they do not hinder the driver's vision) only fortuitously.

Most modern wiper control systems use dynamic braking to stop the wipers

at the park position. To interface to these systems, the SCR controllers usually require additional relay switching or the dismantling of the dynamic braking feature — both are undesirable alternatives.

Auto-Wiper is designed to work with a modern wiper system through a simple interface. MOSFET power transistors eliminate the SCR device and its need for external commutation, while providing the dynamic braking essential for proper wiper action. By means of a pulse generated by the cam switch once each cycle, synchronization between Auto-Wiper and the windshield wipers is maintained. Furthermore, these feedback pulses allow varying the number of wipes between



use dynamic braking to stop the wipers | Fig. 1. Car windshield wiper controller schematic.

Windshield Auto-Wiper

continued from page 57

pauses to one, two, three, or more without resetting the pause control.

How it works

As shown in the schematic, the 555 timer IC1 (configured as a gated astable pulse generator with independently adjustable ON and OFF times) derives its feedback from the voltage across the wiper motor. This voltage governed by the park switch pulses in synchronization with the wiper blades. Hence the timer is controlled by the wipers themselves in addition to its

Parts List						
Part	Description					
C1	8.2 μF 50 V 10% solid tantalum capacitor (Sprague Q-Line #QDT1-61)					
C 2	0.01 μF 50 V disc					
C3, C5, C7	0.1 μF 50 V disc					
C4, C6, C8–C10	10 μF 25 V electro					
R1	1 meg linear pot					
R2	33k 1/4 W resistor					
R3	10 meg linear pot					
R4	1k 1/4 W resistor					
R5, R6	120 ohms 1/4 W resistor					
R7	1k 1/2 W resistor					
D1-D3	1N914 or 1N4148 diode					
D4	1N4001 diode					
D5	4.7 V 1 W zener					
D6	Red LED 20 mA					
lC1	555 timer: SE555 or MC1455 chip					
Q1	2N6788 power MOSFET					
Q2	2N6849 power MOSFET					
S1	SPST switch					
F1	6 A fuse and holder					
Note: D5 is used with regular NE555 or						

Note: D5 is used with regular NE555 or LM555 chip. If you use the SE555 or MC1455, omit D5 and put a jumper in its place. This is due to the higher voltage rating ot these parts.

Table 1. Parts list.

ON (WIPES, R1) and OFF (PAUSE, R3) time constants.

When S1 (part of R1) is first closed, low voltage on pin 2 of IC1 triggers the timer into its ON state. MOSFET power transistor Q2 is cut off but Q1 is turned on, allowing power to flow to the wiper motor. Power is also supplied to the motor through the internal diode of Q2 as the park switch cam rotates out of detent. The feedback voltage across the motor charges C1 through WIPES control R1 until the voltage across CI is clamped by D3 just above the upper threshold of IC1.

As the voltage on C1 rises above the upper threshold of IC1, the timer turns OFF turning Q2 on while cutting off Q1. The wiper motor, still powered through the internal diode of Q2, continues to operate until the park switch cam once more rotates into detent. The result is that the feedback voltage remains HIGH, thus preventing the discharge of C1 until the cam rotates into detent.

When this occurs, C1 is freed to discharge through PAUSE control R3 toward the zero feedback voltage across the wiper motor. The voltage on C1 falls until it crosses the lower threshold of IC1, triggering it ON to start the cycle over again. Also, as the cam rotates into detent, the wiper motor's windings are shorted to ground through the wiper switch and Q2.

The resulting dynamic braking halts the wiper blades in their proper park position. During the interval in which C1 is charging through R1, the park switch cam is free to make more than one revolution; thus time constant R1C1 can be varied to allow 1, 2, 3, or more revolutions of the cam before the voltage on C1 reaches the upper threshold of IC1. Similarly, as C1 is discharged through PAUSE control R3 toward the lower threshold of IC1, time constant R3C1 varies the discharge time from zero to 60 seconds or more.

Operation

To start a wipe cycle, it is only necessary to pulse Q1 long enough for the park switch cam to rotate out of detent. Therefore, it is only necessary to advance the WIPES control clockwise until the desired number of wipes are reliably swept. Erratic operation may occur if the control is turned beyond this optimum point. When decreasing the number of wipes, always retard the WIPES control to less than the number of wipes you want, and then advance it as above.

Any desired pause of up to 60 seconds is simply set by the PAUSE control. When first turned on, the initial wipe duration will be somewhat longer than set by the WIPES control. This is caused by C1 charging from zero volts rather than from the lower threshold voltage of IC1 as in subsequent cycles. A useful purpose is served, however, in that the windshield is sure to be wiped clean at the start. The original wiper switch is normally not used, but can at any time override Auto-Wiper.

The Cap'n Crunch LOWFER Loop

continued from page 12

between the loop and the receiver. There are many published designs of simple-to-construct, low-cost preamplifiers of the wideband type. Commercial types are available from suppliers at a moderate cost.

Final note: Remember that the Rx will have to be operated with "BFO On," except when you are listening to the AM broadcast stations.

THE DX FORUM continued from page 41

Harrell, 2011 New High Shoals Road, Watkinsville GA 30677.

Questions can be forwarded to Tom N4XP, at [n4xp@juno.com] or Garry N16T, at [ni6t@intuitive.com].

73, Steve KF2TI

lron Chef DX - Total Master of DX Stadium 10 years running Many challenges, no defeats. Landing, NJ"

Back to Bhutan

This is also hot off the presses. It was provided via the Internet, and is contained in

the Ohio/Penn DX Bulletin #470. I am reprinting it here for the benefit of those who do not have access to the Internet. If you missed the previous A5 operations, you don't want to miss this.

"A5, BHUTAN, Gerard F2VX, President of the Clipperton DX Club (CDXC), reports that their project is now "on the road." They will fly from Paris to Bangkok/Timphu on September 1st and return on the 15th. The team consists of: Alain F6ANA, Denise F6HWU (YL). Alain F5LMJ, Vincent F5MBO/GØLMX, Christian FH/TU5AX, and Gerard F2VX. They will travel with five transceivers: 2 Kenwood TS50, 2 Icom IC706 and 1 Yaesu FT757. They have the authorization of the MOC to use one of the A52A antennas (a Cushcraft triband A3S). Also, they will have verticals and dipoles for the other bands and the WARCs. Power is still limited to 100 watts. They ask the DX community to help them with their project. Since the past 20 years, the CDXC has sponsored many international DXpeditions, for other DX Clubs from all around the world. They hope some clubs or associations could help them. The cost for this 'A5' activity with travel. staying in A5, and license, is around 23,000 F (or \$3400 USD) for each operator! The QSL manager will be F8RZ (Jean). All the team's members are members of both the Clipperton DX Club and REF-Union."

Many thanks to the folks at the *Ohio/Penn DX Bulletin* for condensing and relaying this great news item.

VK9C - Cocos Keeling DXpedition

I was recently informed that the DXpedition planned by VK6KZ and VK6HK is still on for October 21st through November 4th of this year. They are rumored to be focused on 6 meters, but will also be equipped to operate on 40 through 10 meters if the conditions on 6 are nothing to write home about. If anyone has more current information, please pass it on.

Pulling the big switch

So much for this month's offering. I look forward to hearing from all of you very soon, so ...

73 and good DX!

73

HOMING IN

continued from page 43

broadcast-band signals were trouncing a tight VHF receiver input.

Back to the roof

For RDF in the broadcast band, I used the pocket transistor radio and its ferrite rod antenna. Such sets are very directional when the rod is oriented horizontally. There are sharp signal nulls off the ends of the rod and broad peaks off the side. As I "sniffed" on the penthouse rooftop with the radio tuned to either 790 or 1390, the strongest signal wasn't coming from the direction of the radio stations' towers, but from the heavy guy wires of the giant Collins tower supporting the HF antenna.

The five guy wires coming down to the roof from the 50-foot mast holding the repeater antenna had very little AM-band RF on them. A sixth guy went from the top of the repeater mast to a spot about 10 feet up on the Collins tower (Fig. 1). What if that guy coupled RF between antenna supports? As an experiment, I disconnected it at the big tower attachment point, inserted an insulator, and re-installed it. The grunge was gone. It never came back.

A grunge hunt is often just like a hidden transmitter hunt, because you never know where you'll end up and you never know what you'll find. In this case, the two broadcast stations were not super-power (only 5 kW each) and not close (14 and 27 miles away). Nevertheless, long guy wires with AM-band resonances and a corroded connection or two were all that it took to create enough unintentional QRM to render a repeater nearly unusable. A similar situation could occur at your club's communication site. Prepare your gear and practice your RDF techniques so you'll be ready.

Have you used RDF to solve an interference problem on your repeater, either accidental or malicious? I'd like to hear about it. I also welcome stories and photos of your local hidden transmitter hunts, on foot or in cars. The E-mail and postal mail addresses are above.

Note

1. As described on pages 158-161 of *Transmitter Hunting—Radio Direction Finding Simplified* by Moell and Curlee, published by TAB/McGraw-Hill. ISBN number 007-1560068.

CALENDAR EVENTS

continued from page 44

demonstrations, VE exams. For VE info call N1JEO at (203) 235-6932. General admission is \$6, children under 12 \$3. This year the special guest speaker will be Wayne Green

W2NSD speaking on "The Day Kruschev Saved Amateur Radio." ARRL speakers include Betsy Doane K1EIC, CT Section Manager: and Tom Frenaye K1KI, New England ARRL Director. Information is available on the Web at [www.qsl.net/nutmeghamfest]. E-mail [nutmeghamfest@qsl.net]. Proceeds from the event will help support public service, scholarship and civic activities.

SPECIAL EVENTS, ETC.

SEPT 2-3

PLATTEVILLE, WI The Hidden Valleys ARC will operate as K9S (Canine Sheep) during the 15th annual national points Platteville Sheepdog Trial. The station will be on the air from 1500Z-2200Z Sept. 2nd and 3rd. Suggested frequencies are the General class portions of phone and CW bands, plus VHF. For a certificate, send a 9 x 12 SASE to HVARC, P.O. Box 112, Platteville WI 53818-0112.

SEPT 16

SLIDELL, LA In celebration of 36 years of community service and ham radio fun. the Ozone ARC will operate W5SLA Sept. 16th, 1300–2200 UTC. Frequencies: 14.250 ± QRM and 7.240 ± QRM. Contact Michael White, 404 Holmes Dr., Slidell LA 70460.

OCT 9-15

ATLANTIC CITY, NJ The Southern Counties ARA will operate K2BR from Oct. 9th at 1400 UTC to Oct. 15th at 0400 UTC, from the Miss America Pageant in Atlantic City NJ. Atlantic City is located on Absecon Island, which is IOTA NA111. Suggested frequencies for 10, 15, 20 and 40 meters: Phone — 28.325, 21.325, 14.250, and 7.250. CW — 28.030, 21.050, 14.050 and 7.050. QSL with a #10 SASE to SCARA, P.O. Box 121, Linwood NJ 08221.

HBOUE & BEYOND

continued from page 46

hand mic, and with the T-81A being fourband it was an antenna problem initially till I figured out that the multiband duplexers and triplexers will work in either direction. I could just as well have provided a rotary coax switch to feed a single 6 meter antenna on one switch position. The second position would be the high gain 2 meter and 3/4 meter gain antenna. Position three would be a 1.2 GHz antenna. Either way, be it a switch or triplexer, either will give you options that can be easily handled, especially with the

Check the Days After

The exact peak of any sunspot cycle cannot be accurately forecast, it can only be "postcast." Although we may be close to the peak of Cycle 23, the actual peak may be ahead of us or it may have already passed. Only careful measurements taken over a period of several months will be able to tell.

September is likely to show an improvement in HF radio propagation compared with the summer "doldrums" of June, July, and August, but September 10th through 20th are expected to be days during which the Earth's magnetic field (hence ionosphere) will be upset to active ... most likely due to solar flares and other activity on the sun.

Frequently, however, the days following the worst disturbances can often prove to

be among the best, so be sure to carefully check the 7th, 13th, and 19th, which may be such days.

General band-by-band forecast

10 and 12 meters

Fairly regular DX may be expected on Good (G) days to Europe and the East before noon, and to Africa shortly after noon.

Also, you may find good band openings to South America, the Pacific, and the southern hemisphere during the afternoon. Short skip between 1,000 and 2,000 miles during the day is anticipated for most days.

GMT:	00	G2	04	06	08	10	12	14	16	18	20	22
ALASKA	10/12		20			_	17/20	20			15/17	10/12
AUSTRALIA	10/12	17/20	20	20	20	30/40	30/40	17/20		 		10/12
CENTRAL AM.	15/17	17/20	17/20	17/20	17/20	15/17	15/17	10/12	10/12	10/12	17/20	10/12
EUROPE	17/20	30/40	40/80	40/80	30/40			15/17	10/12	15/17	15/17	17/20
FAR EAST	10/12		17/20				17/20	17/20			15/17	10/12
HAWAII	10/12	12/15	17/20	17/20	20/30	20/30	17/20	17/20				10/12
INDIA	17/20	17/20				l		15/17				
MID-EAST	20	20	20						10/12	10/17	15/17	15/20
PUSSIA/C.I.S.	30/40	30/40	17/20	17/20				10/12	10/12	12/15	17/20	17/20
S.E. ASIA	15/17		17/20	17/20			17/20	15/17	10/12			15/17
SOUTH AFRICA	20/30	40	20/3C	20/33					10/12	10/12	12/15	12/15
SOUTH AM.	15/17	15/17	20	30/40	30/40			10/12			12/15	12/15
WEST COAST	20/30	20/30	20:30	30/40	30/40		ľ	10/12	10/12	10/12	15/17	17/20

EASTERN UNITED STATES TO:

CENTRAL UNITED STATES TO:

ALASKA	10/12	12/15	17/20	17/20	20		17/20	17/20				10/12
AUSTRALIA	10/72	15/17	15/17		17/20	20/30	30/40	17/20		1	12/15	10/12
CENTRAL AM.	15/17	15/17	17/20	17/20	23/30			10/12	15/17	10/12	10/12	10/12
EUROPE	30/40	30/40	30/40						12/15	12/15	17/20	17/20
FAR EAST	10'12	12/15	17/20	17/20	17/20		17/20	17/20				10/12
HAWAII	12/15	15/17	15/17	17/20	17/20	20/30	30/40	17/20		10/12	12/15	12/15
INDIA	15/17	17/20						12/15	12/15		İ	
MID-EAST	20	20							15/17	15/17	15/17	
RUSSIA/C.I.S.								12/15	12/15	12/15	17/20	17/20
S.E. ASIA	10/12		15/20	17/20		-	_		10/12	10/12		
SOUTH AFRICA			17/20	17/20	Ī				12/15	12/15	15/17	17/20
SOUTH AM.	15/17	15/17	20/30	20/30	17/20			10/12			10/12	12/15

WESTERN UNITED STATES TO:

ALASKA	10/12	10/12	15/17	17/20	17/20	17/20		17/20	17/20			15/17
AUSTRALIA	10/12	12/15	15/17	15/17	17/20	17/20	17/20		17/20			
CENTRAL AM.	10/12	12/15	:5/17	17/20	30/40	i —			10/12	10/12	10/12	12/15
EUROPE	17/20	17/20	İ		<u> </u>	i —			15/17	15/17	17/20	17/20
FAR EAST	10/12	10/12	12/15	17/20	17/20	17/20			17/20	· · · ·		15/17
HAWAII	10/12	10/12	12/15	15/17	20/30	20/30	30/40		12/15	10/12		
INDIA		15/17	17/20						12/15	35/17		
MID-EAST	20									15/17	15/17	20
RUSSIA/C.I.S.	17/20				17/20			17/20	17/20	20	20	20
S.E. ASIA	10/12	10/12						17/20	15/17	17/20		
SOUTH AFRICA	17/20	20	<u> </u>	20		_				10/12	12/15	12/15
SOUTH AM.	10/12	12/15	15/17	17/20	17/20						10/12	10/12
EAST COAST	20/30	20/30	30/40	30/40	30/40			10/12	12/15	12/15	15/17	17/20

15 and 17 meters

You can look for excellent daytime DX to the southern hemisphere and to

most areas of the world, peaking to Europe before noon and to most other areas of the world during the afternoon; daytime short skip beyond 1,000 miles will be frequent.

20 meters

Excellent DX openings to most areas of the world are expected on Good (G) days from local sunrise until long after sunset. Peak conditions should occur an hour or two after sunrise and again in the late afternoon. On Good (G) days, DX into the southern hemisphere can be worked during the hours of darkness as well. Short skip from 500 to over 2,000 miles is anticipated on most days.

30 and 40 meters

These may be your best DX bands from local sunset until sunrise, when you can expect frequent openings and often strong signals into the southern hemisphere. Daytime short skip to about 1,000 miles is expected, and beyond 750 miles after dark.

80 and 160 meters

Worldwide DX can be expected from local sunset through the darkness hours on

September 2000						
SUN	MON	TUE	WED	THU	FRI	SAT
					1 F	2 F
3 F	4 F	5 F-P	6 P	7 P-F	8 F	9 F
10 F-P	11 P	12 P	13 P-F	14 F-P	15 P	16 P
17 P-VP	18 VP-P	19 P-F	20 F-G	21 G	22 G	23 G
24 G	25 G-F	26 F	27 F-G	28 G	29 G	30 G

Good (G) nights, limited of course by thunderstorm static on some paths. Short skip at night will extend between 1,000 and 2,000 miles.

RBOVE & BEYOND

continued from page 59

small SMA coaxial connectors being used, making for a miniature installation.

Well, that's it for this month. I hope you have enjoyed my trip through my HT fantasy from early years to present. I highly recommend you take a good look at the Icom IC-T81. You will find it to be a great versatile multiband HT that is usable from 6 meters to 1200 MHz. 73, Chuck WB6IGP [clhough@pacbell.net].

ON THE GO

continued from page 47

hand, state and local agencies are very budget-oriented so explaining our service in terms they can understand makes all the sense in the world. Are we charging for our services (i.e., is there a cost?)? NO! Does this provide a significant benefit (i.e., is there a value?)? ABSOLUTELY! Should we as hams understand this? I certainly think so.

This value is the reason that we get the benefits we do. The federal, state, and local governments need to see the value we are providing in terms that fit their needs. I strongly recommend that we continue to report the value of our services in a form that our supported agencies can understand. Without this, we are just another hobby. Now, if we could just convince some of our brother and sister hams of the logic in this, we'd be much better off. Let's make sure that each of us is an ambassador for amateur radio rather than a destructive critic of it.

ORA

continued from page 6

- When your dad is mad and asks you, "Do I look stupid?", don't answer him. Heather, 16.
- Never tell your mom her diet's not working.
 Michael, 14.
- Don't pick on your sister when she's holding a baseball bat. Joel, 12.
- When you get a bad grade in school, show it to your mom when she's on the phone. Alyesha, 13.
 - Never try to baptize a cat. Laura, 13.
 - · Never spit when on a roller-coaster. Scott, 11.
 - Never do pranks at a police station. Sam, 10.

- Beware of cafeteria food when it looks like it's moving. Rob, 10.
- Never tell your little brother that you're not going to do what your mom told you to do. Hank,
 12
- Remember, you're never too old to hold your father's hand. Molly, 11.
- Listen to your brain. It has lots of information.
 Chelsey, 7.
 - · Stay away from prunes. Randy, 9.
- Never dare your little brother to paint the family car. Phillip, 13.
 - · Forget the cake, go for the icing. Cynthia, 8.
- Remember the two places you are always welcome — church and grandma's house.
 Joanne, 11.

Thanks to A Joke A Day, via ARNS Bulletin, January 1999.

Electromagnetic Fields and Suicide

Researchers from the University of North Carolina report that electric utility workers appear to commit suicide at a higher than average rate. As recounted in the March 15th issue of the *Journal of Occupational and Environmental Medicine*, a study of about 10,000 workers routinely exposed to low frequency electromagnetic fields shows that this group commits suicide twice as often as non-utility workers. The contrast was most evident in younger workers.

While the researchers suspect that electromagnetic radiation affects the production or metabolism of melatonin, that theory is not shared by others — in part, because no other information on other aspects of the physical condition of the study participants was made known.

Thanks to published news reports, via Newsline, Bill Pasternak WA6ITF, editor.

NEVER SAY DIE

continued from page 8

and, as you know, you can't fool Mother Nature.

My mother was more enlightened in many ways than others, but she sure messed up on languages. So I had a terrible time in high school struggling to learn enough French so a college would accept me. Well, that was before I knew what a rip off colleges were. And are. My mother fed me right. No sugar, no white bread. No cold cereals. No jam or jellies, no soda pop. It wasn't until I went to church choir camp one summer that I was introduced to white bread and strawberry jam. The result was that I had perfect teeth until I joined the Navy. Three years later I had my first filling.

Play lots of kinds of music for your babies. They particularly enjoy strong rhythmic beats such as you have with Latin music: tango, salsa, cha cha, bolero, beguine, rumba, mambo, samba, lambada, bossa nova, paso doble, and also the polka, peabody, and waltz. Who knows, with the added brainpower they'll build, and their love of music, you could end up with a musical child prodigy. The world sure could use some of those.

Ka-Boom

We've gotten so used to the stock market continuing it's upward movement that the bears are hibernating. I'm going to poke them with a pointed stick.

The standards, for many years, for determining the value of stocks has been the price-to-book-value-ratio, the price-earnings ratio, or the dividend yield. By any of these measures the stock market today is overvalued by about 50%. Any move to return to fundamentals could trigger a disaster.

Today, with over half of American households investing in the market, a big drop in stock prices would quickly trigger the public to cut spending. A 30% drop in the market would make Americans \$5 trillion poorer. And historically that would reduce spending by about \$250 billion, impacting corporate investment, the real estate market, and almost every business.

With many investors buying stock on margin, any significant downward drop in stock prices forces brokers to call their customers for more margin money. Lacking a fast cash response to the margin call, the broker has to sell the stock for whatever he can get for it. This, naturally, speeds a stock's downward plunge. That's what happened in 1929, when many investors had borrowed up to 90% on margin. All it took was a 10% drop in the market and they were wiped out.

What could trigger such a plunge? Well, we're spending about \$30 billion a month more on imports than we're getting back from our exports, so we've been making up the difference by selling American assets, bank CDs, stocks, and Treasury bonds. This is fine as long as the foreign lenders think they'll do better with their investments here. It wouldn't take a lot to have them decide to sell, driving down the value of the dollar. This is what happened in Southeast Asia a couple years ago, and it triggered a deep recession.

If anything happens to burst our growth bubble, the spending boom will end and we'll be in a heap of trouble.

Emancipation

The word means to free from bondage, oppression, or authority. Set free. Liberation.

A little over two hundred years ago the thirteen colonies got fed up with the increasingly lousy deal England was handing them and we had a revolution. Tens of thousands of the colonists gave their lives to gain this freedom from exploitation by the British.

A new kind of country was established. One for the people and by the people. And this worked pretty well for the next hundred

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years. But, in the last hundred years we've seen our freedoms gradually taken away and our lives controlled increasingly by a government vastly beyond anything envisioned by the men who established the country. Further, we see this government today being controlled, in turn by secret government agencies and big business.

Ten years ago I was asked by Governor Gregg to serve on an Economic Development Commission, a group which he hoped would help steer New Hampshire out of the worst recession it had experienced in decades. Unfortunately, the Commission was made up of both businessmen and politicians, and the politicians naturally took control of it, making sure that the Commission would not upset any gravy trains.

I refused to be blocked, preparing reports on the problems we'd investigated during a year of subcommittee work and proposing practical solutions to the Commission members. The businessmen members, seeing the political handwriting on the wall, bailed out of the Commission, which eventually disappeared without ever submitting a report to the governor and the Legislature.

I hated to see all that work be wasted, so I reprinted my reports in a 360-page book, We The People Hereby Declare War on Our Lousy Government. The 5,000 copies I printed sold out, but with no noticeable effect.

I reported on how seriously flawed our mandatory public school system was, and showed proven ways it could be enormously improved, while costing less than half as much to run. I showed how New Hampshire tourism, our largest industry, could easily be doubled. I showed how we could cut the cost of our prisons by up to 90% and end up with a far more effective prison system. And so on.

So here we are today, in the year 2000, a nation of sheep. We endure taxes of over 60% of our wages. We endure a unioncontrolled public school system which is teaching our kids less than any other developed country, and which has been purposely designed to make sure we don't have the guts to change it. We endure fluoridation of our water, which is also aimed at making us docile. We endure police forces out of control, government bureaus such as the BTF, which kill protesters. We are under constant surveillance by the NSA, which checks our every phone call, every fax, and every email. We endure the CIA killing heads of state of foreign countries. We know Congress has stolen every dollar of our hard earned Social Security money. Unless we are truly asleep we know that we're being manipulated by the media with one pathetic drama after another (Monica, Elián), none of any great significance to our lives.

If you've bothered to read any of the books I've reviewed in my editorials, which I've reprinted in my Secret Guide to

Wisdom, you know that our medical industry is crooked clear through.

Crooked? Studies show that there are over 2.4 million unnecessary operations a year, and that about 12,000 people die from these. We know that 400,000 balloon angioplasties were performed last year, though there's no proof whatever that these painful and dangerous operations are more effective than non-surgical therapy. We know that 70% of mammograms are incorrect, and that over 90% of the ultrasounds on pregnant women are not necessary, and worse, can cause permanent damage to the baby. We know that most of the hysterectomies are unnecessary. We know that the drugs used to treat arthritis have little or no effect on the patient, and that 60% of impotence is caused by prescribed drugs and that, despite billions being spent, no progress has been made in dealing with either cancer or heart disease. Please, just read the books I've reviewed on the subject and see what a patsy you and your family have been.

Step one is to break out of your protective shell of ignorance and educate yourself. Step two is to start getting your friends interested in educating themselves. Step three is to stop re-electing your crooks to Congress.

The "system" depends on everyone being a sheep, eating the food from our giant corporations and then going to the doctor when they get sick. We're dutifully and unquestioningly working at jobs with no future, and of little real meaning. We're sacrificing 30 to 60 years of potentially vibrantly healthy life and the freedom to do what we want, when we want. If I said, hey, drop everything and come with me to Chile in a couple of weeks, you'd have to say you couldn't get away from the job, and besides, you couldn't possibly afford it. This is freedom?

I'm calling for emancipation.

Puff-Puff

Just in case you, or someone you know, is still addicted to cigarettes, I thought I'd pass along a report from the British Journal of Neurology linking intellectual impairment in later life with smoking. Smoke and get even dumber, is what they're saying. And the decline in mental powers they measured was not trivial, it was quite significant.

With all the scientific evidence showing the damage smoking does, today it is an act of monumental stupidity for a kid to take up an expensive, life-long drug addiction to smoking cigars or cigarettes. Dumb and dumber.

PC Survivors

In cleaning out my old files I ran across the January 1983 issue of *Time* with the Machine of the Year on the cover. Lordy, that was 17 years ago! They had a nice article on Steve Jobs, but the rest of the cast

is where now? Ed Roberts, who started all this with his Altair 8800, is now a doctor. So, what happened to Jack Tramiel and his Commodore computers? Adam Osborne? Clive Sinclair? David Ahl? Bill Godbout? George Morrow? What ever happened to Gary Killdall and his CPM operating system? Heck, what happened to Wayne Green and Byte, 80-Micro, Microcomputing, Run, InCider, Hot Cocoa, and Desktop Computing?

Well, the PC has revolutionized everything, far beyond what *Time* predicted, even if most of the pioneers have disappeared into the mist.

Syzygy

That's the time of the new or full Moon, and that's connected with earthquakes.

In case you believe that some people aren't able to accurately predict earthquakes, just because the experts can't, let me enlighten you. For instance, there's Clarisa Bernhardt who, on November 25th, 1974, predicted on a Los Gatos FM station that there would be a 5M quake for the Bay Area on Thanksgiving Day at 3 pm. At 3:01 they had a 5.2M quake in the area, the strongest in the area in five years.

Dogs, cats and other animals seem somehow to be aware that a quake is coming, even if the experts aren't. You've probably read about the guy who noticed that just before a quake there would be a great increase in lost pet ads in the papers.

You can learn a lot more about this field by reading the earthquake newsletter, Syzygy. Send a SASE for a sample copy to Syzygy, Box 1926, Glen Ellen CA 95442. And check out www.syzygyjob.com. The job stands for James O. Berkland, the editor.

21st Century

All those know-nothings who've been braying about the 21st century starting next year are full of barn dust. They haven't, as usual, done their homework. Well, I have.

Our year numbers didn't even get started until 525 AD, when Dionysius Exiguus estimated Christ's birth, missing it by about seven years. Well, that was before calendars and computers, so he did pretty well. The year I AD immediately followed I BC. Remember that Roman Numerals have no zero, so there was no year zero. For that matter, there were no centuries until the fifth. This, right now, really is the 21st century. Get used to it.

Band Scan Project

As if we aren't causing the FCC enough aggravation by bickering over the recent rule changes, along come two Texas hams petitioning for more phone spectrum in our ham bands. They want to cut the CW bands by 50%. Well, of course, it's about damned time, in my humble opinion

Wise Up!

Here are some of my books which can change your life (if you'll let 'em). If the idea of being healthy, wealthy and wise interests you, start reading. Yes, you can be all that, but only when you know the secrets which I've spent a lifetime uncovering.

.....Wayne

The Bioelectrifier Handbook: This explains how to build or buy (\$155) a little electrical gadget that can help clean the blood of any virus, microbe, parasite, fungus or yeast. The process was discovered by scientists at the Albert Einstein College of Medicine, quickly patented, and hushed up. It's curing AIDS, hepatitis C, and a bunch of other serious illnesses. The circuit can be built for under \$20 from the instructions in the book. \$10 (#01)

The Secret Guide to Wisdom: This is a review of around a hundred books that will help you change your life. No, I don't sell these books. They're on a wide range of subjects and will help to make you a very interesting person. Wait'll you see some of the gems you've missed reading. \$5 (#02)

The Secret Guide to Wealth: Just as with health, you'll find that you have been brainwashed by "the system" into a pattern of life that will keep you from ever making much money and having the freedom to travel and do what you want. I explain how anyone can get a dream job with no college, no résumé, and even without any experience. I explain how you can get someone to happily pay you to learn what you need to know to start your own business. \$5 (#03)

The Secret Guide to Health: Yes, there really is a secret to regaining your health and adding 30 to 60 years of healthy living to your life. The answer is simple, but it means making some difficult lifestyle changes. Will you be skiing the slopes of Aspen with me when you're 90 or doddering around a nursing home? Or pushing up daisies? No, I'm not selling any health products. \$5 (#04)

My WWII Submarine Adventures: Yes, I spent from 1943-1945 on a submarine, right in the middle of the war with Japan. We almost got sunk several times, and twice I was in the right place at the right time to save the boat. What's it really like to be depth charged? And what's the daily life aboard a submarine like? How about the Amelia Earhart inside story?If you're near Mobile, please visit the Drum, \$5 (#10)

Wayne's Caribbean Adventures: My super budget travel stories — where I

visit the hams and scuba dive most of the islands of the Caribbean. You'll love the special Liat fare which let me visit 11 countries in 21 days, diving all but one of the islands. Guadeloupe, where the hams kept me too busy with parties, \$5 (#12)

Cold Fusion Overview: This is both a brief history of cold fusion, which I predict will be one of the largest industries in the world in the 21st century, plus a simple explanation of how and why it works. This new field is going to generate a whole new bunch of billionaires, just as the personal computer industry did. \$5 (#20)

Cold Fusion Journal: They laughed when 1 predicted the PC industry growth in 1975. PCs are now the third largest industry in the world. The cold fusion ground floor is still wide open, but then that might mean giving up watching ball games. Sample: \$10 (#22). Julian Schwinger: A Nobel laureate's talk about cold fusion—confirming its validity. \$2 (#24)

Improving State Government: Here are 24 ways that state governments can cut expenses enormously, while providing far better service. I explain how any government bureau or department can be gotten to cut it's expenses by at least 50% in three years and do it cooperatively and enthusiastically. I explain how, by applying a new technology, the state can make it possible to provide all needed services without having to levy any taxes at all! Read the book, run for your legislature, and let's get busy making this country work like its founders wanted it to. Don't leave this for "someone else" to do. \$5

Mankind's Extinction Predictions: If any one of the experts who have written books predicting a soon-to-come catastrophe which will virtually wipe most of us out are right, we're in trouble. In this book I explain about the various disaster scenarios, like Nostradamus, who says the poles will soon shift (as they have several times in the past), wiping out 97% of mankind. Okay, so he's made a long string of past lucky guesses. The worst part of these predictions is the accuracy record of some of the experts. Will it be a pole shift, a new ice age, a massive solar flare, a comet or asteroid, a bioterrorist attack? I'm getting ready, how about you? \$5 (#31)

Moondoggle: After reading René's book, NASA Mooned America, I read everything I could find on our Moon landings. I watched the videos, looked carefully at the photos, read the astronaut's biographies, and talked with some of my readers who worked for NASA. This book cites 25 good reasons I believe the whole Apollo program had to have been faked. S5 (#32) Classical Music Guide: A list of 100 CDs which will provide you with an

outstanding collection of the finest

classical music ever written. This is

what you need to help you reduce stress. Classical music also raises youngster's IQs, helps plants grow faster, and will make you healthier. Just wait'll you hear some of Gotschalk's fabulous music! \$5 (#33)

The Radar Coverup: Is police radar dangerous? Ross Adey K6UI. a world authority. confirms the dangers of radio and magnetic fields. \$3 (#34)

Three Gatto Talks: A prize-winning teacher explains what's wrong with American schools and why our kids are not being educated. Why are Swedish youngsters, who start school at 7 years of age, leaving our kids in the dust? Our kids are intentionally being dumbed down by our school system—the least effective and most expensive in the world. \$5 (#35)

Aspartame: a.k.a. NutraSweet, the stuff in diet drinks, etc., can cause all kinds of serious health problems. Multiple sclerosis, for one. Read all about it, two pamphlets for a buck. (#38)

One Hour CW: Using this sneaky booklet even you can learn the Morse Code in one hour and pass that dumb 5wpm HF entry test. \$5 (#40)

Code Tape (T5): This tape will teach you the letters, numbers and punctuation you need to know if you are going on to learn the code at 13 or 20 wpm. S5 (#41) Code Tape (T13). Once you know the code for the letters (#41) you can go immediately to copying 13 wpm (using my system). This should only take a couple of days. S5 (#42)

Code Tape (T20): Or, you can start right out at 20 wpm and master it in a weekend. \$5 (#43)

Wayne Un-Dayton Talk: This is a 90minute tape of the talk I'd have given at the Dayton, if invited. \$5 (#50)

Wayne Tampa Talk: This is the talk I gave at the Tampa Global Sciences conference—where 1 cover amateur radio, cold fusion. health, books you should read, and so on. \$5 (#51)

SI Million Sales Video: The secret of how you can generate an extra million dollars in sales just by using PR. This will be one of the best investments you or your business will ever make. \$40 (#52) Reprints of My Editorials from 73. Very few things in this world are as we've been taught, and as they appear. I blow the whistle on the scams around us, such as the health care, our school system.. our money, the drug war, a college education, sugar, the food giants, our unhealthy food, fluorides, EMFs. NutraSweet, etc.

1996 Editorials: 120 pages, 100 choice editorials. \$10 (#72)

1997 Editorials: 148 fun-packed pages. 216 editorials. \$10 (#74)

1998 Editorials: 168 pages that'll give you lots of controversial things to talk about on the air, \$10 (#75)

1999 Editorials: 132 pages of ideas, book reviews, health, education, and anything else I think you ought to know about. \$10 (#76)

2000 Editorials: In the works.

Silver Wire: With two 3" pieces of heavy pure silver wire + three 9V batteries you can make a thousand dollars worth of silver colloid. What do you do with it? It does what the antibiotics do, but germs can't adapt to it. Use it to get rid of germs on food, for skin fungus, warts, and even to drink, Read some books on the uses of silver colloid, it's like magic. \$15 (#80)

Wayne's Bell Saver Kit. The cable and instructions enabling you to inexpensively tape Art Bell W6OBB's nightly 5-hr radio talk show. \$5 (#83) NH Reform Party Keynote Speech. It wow'd 'em when I laid out plans for NH in 2020, with much better, yet lower cost schools, zero state taxes, far better health care, a more responsive state government, etc. \$1 (#85)

Stuff I didn't write, but you need: NASA Mooned America: René makes an air-tight case that NASA faked the Moon landings. This book will convince even you. \$25 (#90)

Last Skeptic of Science: This is René's book where he debunks a bunch of accepted scientific beliefs – such as the ice ages, the Earth being a magnet, the Moon causing the tides, and etc. \$25 (#91)

Dark Moon: 568 pages of carefully researched proof that the Apollo Moon landings were a hoax—a capping blow for René's skeptics. \$35 (#92)

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	gth stress reduction so send me your Adventures In Music CD catalog pt foreign, though we try to get most orders shipped in a day or two.					

Barter 'n' Buy

Turn your old ham and computer gear into cash now. Sure, you can wait for a hamfest to try and dump it, but you know you'll get a far more realistic price if you have it out where 100,000 active ham potential buyers can see it, rather than the few hundred local hams who come by a flea market table. Check your attic, garage, cellar and closet shelves and get cash for your ham and computer gear before it's too old to sell. You know you're not going to use it again, so why leave it for your widow to throw out? That stuff isn't getting any youngerl

The 73 Flea Market, Barter 'n' Buy, costs you peanuts (almost)— comes to 35 cents a word for individual (noncommercial!) ads and \$1.00 a word for commercial ads. Don't plan on telling a long story. Use abbreviations, cram it in. But be honest. There are plenty of hams who love to fix things, so if it doesn't work, say so.

Make your list, count the words, including your call, address and phone number. Include a check or your credit card number and expiration. If you're placing a commercial ad, include an additional phone number, separate from your ad.

This is a monthly magazine, not a daily newspaper, so figure a couple months before the action starts; then be prepared. If you get too many calls, you priced it low. If you don't get many calls, too high.

So get busy. Blow the dust off, check everything out, make sure it still works right and maybe you can help make a ham newcomer or retired old timer happy with that rig you're not using now. Or you might get busy on your computer and put together a list of small gear/parts to send to those Interested?

Send your ads and payment to: 73 Magazine, Barter 'n' Buy, 70 Hancock Rd., Peterborough NH 03458 and get set for the phone calls. The deadline for the December 2000 classified ad section is October 10, 2000.

President Clinton probably doesn't have a copy of Tormet's Electronics Bench Reference but you should. Check it out at [www.ohio.net/~rtormet/index.htm]—over 100 pages of circuits, tables, RF design information, sources, etc. BNB530

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NEVER SAY DIE

continued from page 62

(Wayne, humble? Har-de-har!). Well, if you've been reading my editorials for long you know that I tend to keep my opinions to myself and it takes wild horses to drag them out. There are a lot of wild horses around, apparently.

But let's not allow any bias on my part, or that of two Texas hams, get involved with this ridiculously long overdue reduction of the CW bands. So, here's what I propose—and you're going to like this because you'll be able to do it while sitting on your (fat?) ass. There I go, getting insulting, just because I was able to deblimp myself 28 years ago I figure anyone should be able to. I was fa-a-at.

Okay, here's the program. I want you to take the time to slowly tune every one of the ham bands at least once a day, counting the number of signals you hear. How many CW. How many phone. How many something else.

Send me your counts, showing the date, time and band you counted, and I'll put the info into my trust iMac and we'll see how well we've apportioned the spectrum for CW vs phone as of 2000. And that'll give the FCC some solid data to work with.

Send your surveys to Ham Band Scan, Box 360, Hancock NH 03449.



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QRX . . .

Jim Gray W1XU/7 SK

We note with considerable sadness the passing of longtime 73 friend and employee Jim Gray W1XU/7 on June 30. While our ham ranks have been filled with many a fine gentleman throughout the decades, surely none was more so than Jim. And what a life he led

No doubt a portend of things to come, Jim's birth on June 12, 1927, came just a month after Lindbergh flew the Atlantic. Jim was first licensed as a pilot at the age of 16, in 1943, and continued to fly until 1990. He held both a private power rating for aircraft and a commercial glider license, and

spent 16 years flying gliders out of Harris Hill in Elmira NY.

An army veteran of both WWII and later Korea (which often befuddled those who swore he had to have been Air Force), Jim got his first ticket in June 1950 as a Class B ham with the callsign W2EUQ. For this, he had to pass a 13 wpm code test (one minute solid copy required), and an essay-type technical examination where circuit drawing from memory was required.

The Class B ticket allowed CW on all bands 160–10, and phone privileges on 160, 11, and 10 meters,

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NEUER SAY DIE

Wayne Green W2NSD/1

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Anniversary

Sigh. If you're a relatively new reader, there's too much to tell for me to recap the 40 years since I started publishing 73. You can check out my been-there, done-that list on my Web site: [www.waynegreen.com]. If you've been reading 73 for a few years, you've already read about it. My goal now is to celebrate the 50th anniversary in 2010. I'm even making a good try for being around in 2060 to celebrate the 80th anniversary. That's if I can repair the damage I've done to my body through ignorance over the last 75 or so years. I'm working on it.

Of course, if amateur radio blows away, that would put an end to the publication.

Thus, I was sorely dismayed to read the minutes of the recent ARRL board meeting and see nothing whatever proposed by any board member or officer in the way of a major initiative to make the hobby better known.

I enjoy writing these editorials, and doing the research it takes to make sure I'm on firm ground, but I'm disappointed that my pleas for letters from you have gone unanswered.

I've asked you to write and tell me about some of your most exciting adventures that amateur radio has provided. These would not only interest our readers, but could be collected to make a great book to infect youngsters with the ham virus

And if you haven't had any ham radio adventures worth writing about, why the heck not? What's the deal? What's the matter with you? Heck, by the way, I believe, is a small,

not quite as harsh, subdivision of hell.

What does it take to get you to start thinking about (a) how amateur radio can be improved; (b) how 73 can be improved (and never mind any crummy wisecracks about cutting back my editorial — they tried that a few years ago and lost 60% of our subscribers); (c) how we can attract more youngsters into the hobby?

If that doesn't get your word processor going, (d) how about a letter or a piece telling us how amateur radio has changed your life; (e) what's the most fun you've had in the hobby; (f) has amateur radio provided you with any adventure?

Jeesh, I've hammed from a balloon over the South African veldt, from a C-54 flying around the world, from the Korean DMZ, from the famed American Embassy in Tehran, while skiing in Aspen, and from many commercial planes while flying across the country (with the pilot's permission). How about working my home station on 75m from Australia! And working Moscow by ham satellite!

Now, get busy and bury me with letters. The best I'll put together into a propaganda booklet ham clubs can use to snooker kids into joining our fun. Yes, I'd appreciate a disk copy. Oh, heck, you can (gulp!) E-mail 'em to me at w2nsd@aol.com. Just what I need — more E-mail. Not.

New Novice?

Jim McCarthy WN4GMT called to order some of my books. When he upgraded, he opted for his original Novice call ... and got it back! I'll



bet he'll fake a lot of us out with that one! Good going, there, Jim.

They're Lying

About what? The more I learn, the more I see they're lying about almost everything. They're lying about health, education, drugs, our money, taxes, and on down the list.

Bore is lying (big surprise). About what? About his proposed spending plans to provide more money for our schools, for instance. About our needing smaller classes and more teachers. This is the mantra of the NEA, the teachers' union, which seems to have learned a lot from the railroad union about featherbedding.

Congress, ever ready to spend our tax money, has budgeted \$1.3 billion for class size reduction in the Elementary and Secondary Education Act of 2000.

Class size has been shrinking for the last 30 years, down from 22.3 students per teacher in 1970 to today's average of 17. So what's the result? Lower SATs, lower scores compared to students in other countries, and far lower scores compared to 30 years ago. There have been no detectable benefits from the smaller classes.

What does influence student's reading scores? At least one educated parent, family income, the availability of books in the home, and inversely, the time a kid spends watching TV. Race is a big factor, but class size has not had any noticeable effect.

When I went to public school in Brooklyn we had more than 30 students per teacher, and we learned to read circles around today's kids.

Well, how about computers? Bore wants to have every classroom and school library connected to the information superhighway. Little of the stuff they access on the Internet is educational. It's just another way to spend a lot of time having fun — or learning how to hack Defense Department computer systems. There are no studies showing any benefits for kids derived from accessing the Internet.

In the beginning I had hopes that computers would be used for helping kids access information. Indeed, I donated a bunch of computers to two of our local schools to help the kids become computer literate. I wasted my money and their time.

Halving School Costs

Actually; I think we'll be able to cut them by more like 90%, not just 50%. Heck, the Sudbury Valley School costs half as much to operate as the public schools in Massachusetts, and the graduates are far better educated. Far, far better. They even are able to think for themselves, instead of having their initiative, creativity, motivation, and perseverance stunted for life.

Hmm, let's see. About how many teachers do we have? Well, if we have 58 million students and 22 students average in classes, that's around

continued from page 1

but not on 20 or 75 meters. The 12-, 15-, 17-, and 30-meter bands either did not exist or were not yet "authorized" for amateur use. Forty meters was a CW-only band at that time.

One full year of operation on CW was required before taking the Class A exam, which Jim passed in order to receive his Class A ticket, allowing AM phone operation on the 20 and 75 meter bands. SSSC—Single-Sideband Suppressed Carrier as it was called then—was only used by experimental stations and didn't come along for hams until much later. Still later, it was shortened to SSB.

an avocation and a career, plus a whole adult lifetime of enjoyment. Who could ask for more?"

Jim was employed as advertising manager for 73 from July 1980 until December 1985 (later working for *Popular Communications* for four years before retiring), and began his propagation forecast column in 1984, succeeding the late John Nelson. At the time, we felt that we would find no replacement able to duplicate Nelson's incredible accuracy, but W1XU eventually proved us wrong year after year.

Jim married his lovely wife Peg in 1953, and they have two children: Linda and Jim II. No matter where they lived, in New Hampshire or Arizona or wherever, against the sky. Jim had pilot's eyes, that's for sure. What an interesting guy!"

I too once had the experience of flying RC aliders with Jim.

"Go ahead," he said. "Just take the controls, keep the nose up, sniff for the air."

Like Jeff, I could barely see the plane, but I did manage to keep it aloft for a minute or two.

"Go down to the end of the football field, there's an embankment there and we'll get some lift," Jim advised.

That I did, and by now I thought I could see the glider, but wasn't sure. Then it seemed to stop responding to my commands. Uh-oh, I thought.

Then Jim took the controls, and got the craft caught up in some gusts or shear or some such. He then (uncharacteristically) managed to crash it onto the roof of a warehouse. "Not to worry," he said. So I didn't. We eventually retrieved the pieces, but I was in the process of learning that the "not to worry" attitude was just one manifestation of Jim's great inner strength.

As his many QSLs attest, Jim operated CW, AM, and SSB telephony, RTTY, AMTOR, and other digital modes, and also explored the LF, HF, and VHF bands. His favorites, though, as he recently told me, were high-speed CW and 17m SSB. Another big pastime of Jim's, his secret love, was antenna experimentation.

During the Hurricane Agnes flood of 1973, W1XU operated his station for emergency traffic, and at other times he provided phone patches for stations at sea; during the Valdez, Alaska, earth-quake; and for an isolated arctic ice island outpost station.

As Jim once said, "Ham radio has provided

Jim and Peggy were known not just as gracious hosts, but also as warm and caring human beings. Their house and activities were always open to friend and newcomer alike, all of whom were always quickly made to feel right at home.

One other love of Jim's was flying radio-controlled gliders. Jeff DeTray NK1F, former 73 assistant publisher, recently recalled: "I visited his house in Peterborough a couple of times for ham radio activities, and I joined him once at the high school to watch him fly radio-controlled sailplanes. At one point, he handed me the controls and told me to take over. I couldn't even tell which way the aircraft was pointed! To me, it was just a teensy spec

"Er ... Jim, I think I just flew it out of range."

"Not to worry," said my dauntless advisor. "We'll just wait for it to blow back."

Which it did, amazingly. Then Jim took the controls, and got the craft caught up in some gusts or shear or some such. He then (uncharacteristically) managed to crash it onto the roof of a warehouse.

"Not to worry," he said. So I didn't. We eventually retrieved the pieces, but I was in the process of learning that the "not to worry" attitude was just one manifestation of Jim's great inner strength.

Jim died of cancer, without pain, and with quite a number of months to prepare. He just felt uncomfortable all over, he told me. Problem was, he chuckled, every time he tried to describe his condition to Peg, she kept trying to tell him that it sounded like he was pregnant. They were like that together.

He was very happy to have made it through early June, not just for having reached his 73rd birthday — 73 — but because his family was able to celebrate his son's marriage that same weekend. "There was a lot of love in that room," Jim was happy to report.

Before closing, we should use this same space to celebrate the first propagation column by Jim's successor — his son, Jim II. We extend a warm welcome to Jim, knowing that he has been taught well. He lives in Arizona during the winter, and Juneau, Alaska, during the summer. There — guess what? — he's a pilot for Wings of Alaska.

While he was sick, I gave Jim the option of saying something in print to all his friends the world over, regardless of whether he wanted to mention his illness. "I'll leave that up to you," he said. "But I hope you will tell them, all of them, from on the air and off, that it's been a joy, and that I never, ever, will forget them."

"Sounds like you're at peace," I said.

"Who wouldn't be?" Jim laughed. "I've filed my final flight plan in God's hands." — Jack Burnett



Photo A. W1XU/7 doing what he loved best.6 73 Amateur Radio Today • October 2000

NEUER SRY DIE

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2.5 million teachers. Plus around 2.5 million administrators. Now what can our businesses do to assimilate five million poorly educated, often unmotivated workers if we eliminate the need for teachers almost entirely?

With the average K-12 school costing us about \$6,000 per student, and there being four terms a year, that's \$1,500 per term. Let's see, we have a five hour school day, so they're taking a maximum of five subjects per term. That's \$300 per subject.

Now let's suppose that we replace the teacher with a DVD using Hollywood production techniques, star performers, top-notch script writers, and state-of-the-art graphics, making every subject so much fun that kids will be excited about learning. Like movie DVDs, the studio could make a good profit selling them for \$30, and that would include plenty of promotion and advertising in the budget.

That's 10% the cost of teachers who often don't know the subject they're teaching, and who mostly have to depend on the students reading the textbook.

You can see where a 90% cost reduction would be easy. Maybe more like 95%, when there's good, solid competition from several producers.

In addition to covering everything that our schools are supposed to be teaching, there will be a market for courses that should be taught, plus others that kids will want to learn about. And these courses, or programs, will cover high school, college, graduate material, plus business courses.

Working parent families will need schools like Sudbury Valley as baby-sitters while they're working.

Kids, when not dumbed down by our present school system, have an incredible thirst to learn. We just need to pave the way for them.

Bore Promo

The Bore and Gush cam-

paigns are in full swing. I did enjoy the Clinton-Bore organizing of the Million Mom March against guns. This was organized by Donna Thomas, a CBS publicist who works for David Letterman, and is Hillary's closest friend, political strategist, and, frequently, attorney of record — like during the Whitewater scandal. She also helped scare off the women in Arkansas who might sue or squeal on Clinton.

Children and guns. Great political issue, and never mind that children's deaths by guns have gone down 30% in the last decade. The Clinton (Bore) administration claims that 13 children die every day from guns. They don't mention that fewer than 3% are children under 10, and that 70% are teenagers killed in gang fights.

It's all just the usual media hype foofaraw. I hope you didn't get suckered into taking it seriously.

More Bore

Our choice of Bore or Gush

this year is, to me, a clear demonstration of how far we've let our politicians mess up our country. Please don't try to tell me that these two turkeys are the very best potential presidential candidates we have.

We're grumbling about the high gas prices, right? So we have Bore, in his Earth in the Balance book, advocating higher fuel prices. And we have Gush, the oil man, smiling broadly as the gas pumps ding away our bucks.

What we don't have is any constituency for the public investigating the situation and exposing what's really going on. The one thing we do know for sure — we're not being told the truth. Truth and government just don't seem comfortable together.

I don't know how many gigabucks of our taxes are going into the Energy Department black hole, but we might all be able to have an extra vacation if its panjandrums and

Continued on page 61

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R.W.L. Limebear G3RWL 60 Willow Rd. Enfield EN1 3NQ United Kingdom

With Fingers Crossed

The latest on Phase 3-D.

With a bit of luck and a trailing wind, this month should see the long-awaited launch of amateur radio's newest satellite on an Ariane-5 rocket. Here. Richard Limebear G3RWL. FBIS [that's Fellow of the British Interplanetary Society — ed.], tells all about the Phase 3-D amateur radio satellite.

The new spacecraft, currently known as Phase 3-D, will receive the next OSCAR number in the series once it achieves orbit and is proved to be working. Watch the amateur radio media for an announcement of the launch; useful places to watch would be 73 and Radio Today: or, for faster news, the RSGB and AMSAT Web sites at [www.rsgb.org] and [www.amsat.org]; news on the packet radio network; AMSAT nets; etc. This article will try to tell you what to expect from amateur radio's newest venture. For in-depth information about using amateur radio satellites, the reader is referred to the Satellite chapter in the latest Radio Communication Handbook,1 but I'll try to keep the use of jargon to a minimum.

The foremost thing to be aware of is that it won't be available for everyone to use immediately after launch. Once orbit is achieved, it will then be up to the command stations to check it out, and then they'll make some changes to

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the orbit before we, the users, are let loose on it; this will take a few months.

The Ariane-5 flight puts us into what is known as a Geostationary Transfer Orbit; this elliptical orbit has its perigee (the lowest part of the orbit) at about 590 km, apogee (the highest part of the orbit) at about 39,000 km, and an inclination of only about 10°. Phase 3-D's ultimate orbit is different from this, so, once we are delivered into space, it's up to us to move into another orbit plane. Phase 3-D (commonly called P3D) carries its own propulsion in order to make the changes — but these will not happen fast.

The orbit-change philosophy has changed from the previously expected scenario, whereby P3D would fire the main engine a couple of times and then drift for a year or two before a final firing. This is due to Viktor Kudielka OEIVKW, who made a very detailed mathematical analysis of orbital conditions for the best way to reach the final orbit. The good news is that we will reach the final stable orbit after about 10 months, instead of two years as previously expected.

After launch, the ARCJET motor will be used for about 270 days to raise the apogee up to somewhere between | *Photo A. P3D patch*.

60,000 and 75,000 km, and we will then let the orbit drift while natural forces take effect and change the Argument of Perigee. Within this period, there will be at least 120 days of transponder operation for the users, perhaps more, depending on how long the batteries take to recharge after the ARCJET burns.

Another month will then be needed for various maneuvers using the main 400N motor, i.e., raising inclination to 63.4° and reducing the apogee height for a 16h orbit, fine tuning of the orbit, etc. Then the spin will be stopped and P3D turned into three-axis orientation, followed by deployment of the solar arrays.



The above, in particular the 75,000 km apogee, may sound strange to some people, but it's only temporary and is needed for the best efficiency of the maneuvers to reach the stable final orbit.

The final orbit will be tuned to synchronize the period of the orbit with the length of the day, and result in the satellite making exactly three orbits in two days. Every second day the satellite is intended to be in the same part of the sky, in order to make the tracking easier.

The theory goes like this: The average satellite user spends eight hours per day working, eight hours sleeping, and eight hours in leisure activities. Conveniently, the areas of the world with the most amateur radio operators (Europe, America, and Asia) are separated by about eight hours in terms of time zones (or 120° of latitude).

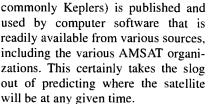
So AMSAT will be aiming for a final orbit that puts P3D into peoples' skies at the time when they will be at leisure. With this orbit, depending on when you look, it will be possible to work almost the whole world (with the exception of a small circle around the antipodal point), but you can work everywhere else if you pick the right time.

Now, what do we have to do to make OSOs? Do we need several kilowatts and a 90-ft. dish in the garden? No. We shouldn't expect to work P3D with a handheld, but 50 W and small beams, preferably with a receive preamplifier, should be OK most of the time - it is designed for the average user, not the kilowatt gang. But P3D has a lot of microwave equipment aboard and, while traditional 2m and 70cm users will be catered for, we expect to make much more usage of the higher bands up to 24 GHz. There has never been so much equipment available for easy use of microwaves — check it out. I'm mainly a CW operator with an HF background and scared of the higher technology ... but even I am planning to use 1260 and 2400 MHz!

Tracking

First of all we need to know about P3D's orbit, the main questions being, "Where do I point my antenna, and when?"

Satellites move, so if we want to use them we need to know where to point the beams ... and when. Orbital data (called Keplerian elements or more



Once P3D's final orbit has been achieved, it should be theoretically possible to nail a beam into one position and see the same satellite window every second day for several hours.

In the meantime, however, and for the greatest DX opportunities, we need to move the beam around. But satellite signals don't just come from out on the horizon. P3D will sometimes be overhead, so it is beneficial to be able to point the antennas upwards to varying

extents (the jargon phrase is in elevation) as well as use the traditional compass (azimuth) directions. Without some means of elevation, there will be times when P3D is out of an ordinary antenna's beamwidth.

However, the best DX will often occur with the beam pointing within 10° of the horizon, so don't let the lack of upward-pointing put you off; you can always add it later if the bug really bites.

Equipment

Simple beams, medium power, and a fairly sensitive receive setup

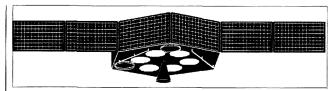


Photo B. Line drawing of P3D.

are the order of the day. Transmitters on 2m and 70cm will need to put about 50 W into the antenna system. But P3D has microwave equipment as well; here, lower powers combined with higher gain antennas will be usable. The bottom line will generally be that 50 to 100 W ERP, once antenna gain and feeder loss has been taken into account, is what's required.

Antennas need not be gigantic, but don't expect too much from ground planes. A minimum requirement for everyday use would be roughly six elements on 2m and 10 elements on 70cm. Of course, on the higher bands we can get quite a lot of gain from fairly small

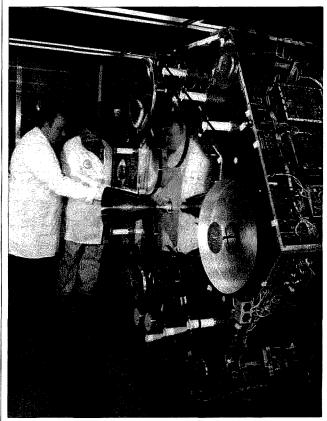


Photo C. Our baby is nearly finished. Peter Gillzow DB2OS (left) and Werner Haas DJ5KQ in the labs at Orlando. (G3RUH photo)

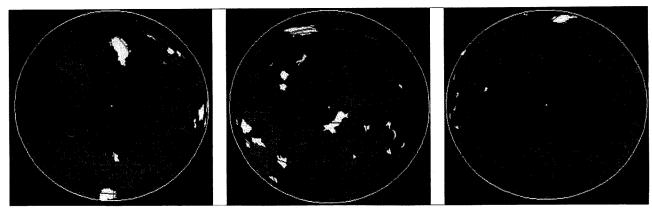


Photo D. Three apogees: over Atlantic, Europe, and Pacific. This is what P3D will be able to see from the top of its orbit. These images are screen-grabs from the AMSAT tracking program InstantTrack.

Uplink Frequencies						
Band	Band Letter	Digital Passband (MHz)	Analog Passband (MHz)			
15m		none	21.210–21.250			
12m		none	24.920-24.960			
2m	· v	145.800-145.840	145.840-145.990			
70cm	U	435.300-435.550	435.550-435.800			
23cm(1)	L	1269.000-1269.250	1269.250-1269.500			
23cm(2)	L	1268.075–1268.325 1268.325–1268.57				
13cm(1)	s	2400.100-2400.350	2400.350-2400.600			
13cm(2)	S	2446.200-2446.450	2446.450-2446.700			
6cm	С	5668.300-5668.550	5668,550–5668.800			
		Downlink Frequencies				
2m	v	same as analog	145.800~145.990			
70cm	U	435.900-436.200 435.475-435.725				
13cm(1)	s	2400.650-2400.950 2400.225-2400.475				
13cm(2)	s	2401.650–2401.950 2401.225–2401.475				
3cm	x	10451.450-10451.750	10451.025-10451.275			
1.5cm	Ka	24048.450-24048.750	24048.025-24048.275			

All receivers are inverting. Telemetry beacons are for command purposes and are modulated in 400 bit/s BPSK, AMSAT format.

Telemetry Beacons (IHU)						
Band	General Beacon (GB) (MHz)	Middle Beacon (MB) (MHz)	Engineering Beacon (EB) (MHz)			
2m	none	145.880	none			
70cm	435.450	435.600	435.850			
13cm(1)	2400.200	2400.350	2400.600			
13cm(2)	2401.200	2401.350	2401.600			
3cm	10451.000	10451.150	10451.400			
1.5cm	24048.000	24048,150	24048.400			

Middle Beacon (MB)

IHU-2 OFF: MB carries normal IHU-1 400 PSK telemetry.

IHU-2 ON: MB carries IHU-2 400 PSK telemetry. However, IHU-2 can also monitor the IHU-1 telemetry stream, and retransmit that if required.

Table 1. P3D's uplink and downlink frequencies, telemetry beacons.

With Fingers Crossed continued from page 11

dish antennas, so there will be no need to fill the garden with aluminum.

Reception is the most critical part of working any satellite. P3D carries beams and dishes, but there will be times when they aren't pointing directly at us. A receive preamplifier, while not mandatory, could make the difference between working the satellite and hearing nothing. Penny for penny, the best investment in any satellite station is in reducing feedline losses and improving reception. Don't expect the signals to push the S-meter off the scale; the usual target is to get the beacon at about S6.

Recommended operating modes for the analog parts of P3D are CW and SSB — FM is not very friendly to the onboard power budget, so please do not use this mode on P3D.

Operations

Satellite operation is generally full duplex; we listen to our own signals coming back from space, and this is facilitated by having the transmit and receive links (called uplink and downlink) on different frequency bands. Table 1 shows P3D's uplink and downlink frequencies. Note, though, that not all the transmitters and receivers will be switched through all of the time. Apart from the problem of transmitting and receiving on the same band, which will desensitize the receiver, the available power is not sufficient to have everything switched on at once, so operations will run to a timetable. Fig. 1 shows the matrix control screen.

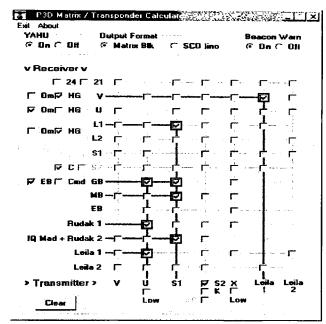


Fig. 1. Band-switching matrix controller. (DB2OS image)

Once P3D has been tested in orbit, the spacecraft will be loaded with a schedule telling it which matrix connections to make. These will often depend on several factors. For instance, the use of microwaves during perigee passes will result in a high value of Doppler shift (a constant rapid change of frequency), so these bands will usually only be operational around apogee, where the Doppler shift is much reduced. Another factor can be the availability of electrical power; if P3D goes into eclipse, then we don't want to flatten the batteries, etc. The timetable will be relative to orbit position (sometimes called phase).

The combination of a receiver on one band feeding a transmitter on another band is generally called a transponder, and particular connections are called modes. Since P3D does not carry transponders, merely separate receivers and transmitters which can be interconnected, the existing mode classification (mode A, mode J, etc.) will cease and will be replaced by a designation of interconnection according to band.

So, a 435 MHz receiver connected to a 145 MHz transmitter (which was "mode B") will be called mode UV, and a 1.2 GHz receiver connected to a 2.4 GHz transmitter will be called

mode LS, etc. The first letter(s) denote(s) the uplink. The old nomenclature had to be changed because there are so many combinations possible with P3D's connection matrix, including multiple receivers connected to multiple transmitters. See Table 2.

Digital modes

As well as the traditional (analog) links, P3D will cany equipment for the digital modes,

including a device called "Rudak." RUDAK stands for Regenerative Umsetzer füer Digitale Amateur Kommunikation (in English: Regenerating Transponder for Digital Amateur Communications). This contains two CPUs, DSP modems, and frequency synthesis equipment, so it is configurable for many (often simultaneous) digital modes. The Rudak module supports 4 x 9600 bps FSK hardware modems, 2 x 153.6 kbps PSK hardware

modems, and 8 x uncommitted DSP modems.

This hardware lineup means we will have a very versatile digital package that, in addition to traditional modes, will be software-configurable for any modulation method that may appear during the satellite's lifetime. The opportunity is also there for people to write software for the modems — we need volunteers to work on this — but DSP experience is a must. The satellite will have up to 250 watts PEP output, or about 60 watts continuous. Of that 60 W, the digital equipment will have

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21 MHz	Т
24 MHz	Н
145 MHz	V
435 MHz	U
1.2 GHz	L
2.4 GHz	S
5.6 GHz	С
10 GHz	×
24 GHz	к

Table 2. New band designations.

about 20 watts allocated to it. Of course, there ain't no such thing as a free lunch. Every digital downlink will need its own slice of the RF power available, so it is unlikely that the full digital capability will be exploited because we want to keep the downlink signals strong enough on the ground. Since P3D is much farther away than a low Earth orbit (LEO) satellite, the path loss is also much greater. The increased path loss, in fact, just about wipes out the advantage of the higher power, so digital users should expect signal strengths similar to current LEO digital satellites.

BBS operation will use the regular PacSat protocols as currently used on

other 9600 bps satellites, but with more memory, more file system entries, and more files kept on board. Users of current digital satellites should be able to work P3D with their existing equipment. We currently have no specific plans for the 153 kbps equipment; possible applications are international wormholes and packet forwarding.

In addition to digital operations, Rudak's processor unit acts as the interface for several onboard experiments. It can also listen to the main beacon output and process that data, probably making it available as files to download from the BBS. But this is just one module on a fairly busy spacecraft, and it is likely that commissioning of Rudak will not occur until some time after launch.

Other payloads

A block diagram showing the complexity of P3D is given in Fig. 2. In addition to the communication and support equipment, P3D carries some other experiments: cameras, radiation and spectrum monitoring, a new type of computer, and GPS.

The SCOPE unit (Spacecraft Camera for Observation of Planets and Earth) will transmit color pictures to

Earth taken with two cameras. One delivers wide-angle pictures of the Earth and sky, and the other has a telescopic lens for pictures with more detail. This module was built by the Japanese AMSAT organization. The digital pictures will probably be compressed using the JPEG technique and stored in Rudak for later downloading. Users may later be given the chance to communicate directly with the experiment to take pictures on demand.

A second camera unit is carried as a technology demonstrator for future experiments. It is not intended to, nor can it, compete with the SCOPE experiment. This will produce black and white images with a slightly wider field of view than the SCOPE narrowangle camera. Later, it might be used as a navigation instrument for Earth or star sensing.

The CEDEX (Cosmic-ray Energy Deposition Experiment) unit examines radiation in space and comes from the UoSat Group at the University of Surrey. It consists of two parts, a Total Dose Experiment (TDE) and a Cosmic Particle Experiment (CPE), which are designed for the varying regions of the orbit. The TDE picks up the total

Continued on page 16

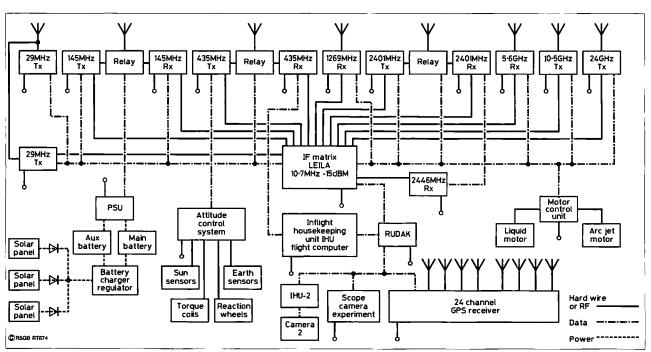


Fig. 2. Block diagram of the Phase 3-D spacecraft.

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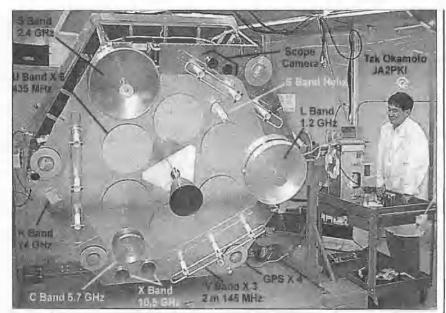


Photo E. Annotated image from the P3D Lab Web pages.

With Fingers Crossed continued from page 14

accumulated doses of ionized radiation inside the satellite. The CPE should measure the effect of particle radiation inside the satellite while close to Earth on its Molniya orbit. These measurements are also interesting in examining radiation effects on the satellite's electronics.

The MONITOR experiment scans the shortwave spectrum from 0.5 to 30 MHz, but there is not much extra information about what this data will be used for.

The experimental AMSAT flight computer technology demonstrator, IHU-2, is an Intel SA-1100 CPU clocked at 133 MHz. This system supports a three-axis accelerometer, microphone, DSP modem, and the black-and-white CMOS camera previously mentioned. Camera, microphone, and accelerometer will be running during separation from the rocket, and data will be downloaded soon after.

GPS receivers are also carried in addition to the regular navigation systems. This will allow onboard processing of orbital data. The primary

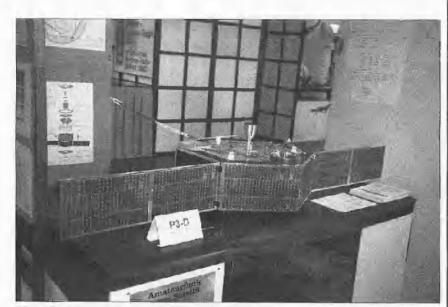


Photo F. Model of P3D.16 73 Amateur Radio Today • October 2000

aim of this equipment is to demonstrate that it is possible to generate the position and attitude of an AMSAT satellite by analyzing the GPS data.

Conclusion

One thing we in AMSAT-UK have been very pleased about in the past is the support of all the radio amateurs here. Whether or not they are interested in satellite communications. most recognize that a lot of hard work is put in by many unsung heroes and they wish us well; we seem to be doing something right. AMSAT-UK is just one of many international groups working together to keep trends in amateur radio up-to-date. If you would like to give us more than just verbal support, why not join and / or contribute directly? Your money will not be wasted (P3D's cost of several million dollars mostly came from voluntary donations). See the AMSAT-UK Web page at [http://www.uk.amsat.org], or write to AMSAT-UK, 40 Downsview. Small Dole, West Sussex BN5 9YB. enclosing a large (no smaller than 9 x 12) SASE, with 5 x IRC or \$3 for airmail postage.

Acknowledgments

- The AMSAT Phase-3D Project, © Norbert Notthoff DF5DP, Ph.D. Sevenpart series in CQ DL, 1997. Translated from German by DG1EFR and WB8IFM.
- AMSAT workers too numerous to mention
 - Web sites such as:

[http://www.amsat.org/amsat/sats/phase3d.html]

[http://www.magicnet.net/~phase3d/]
[http://www.amsat-dl.org/p3d.html]
[http://www.amsat-dl.org/p3dqrg.html] (for updated frequencies)

[http://www.arianespace.com/english/]

[http://www.jamsat.org.jp/scope/index_e.html]

[http://www.amsat.org/amsat/articles/g3ruh/124.html].

• Thanks also to James Miller G3RUH and Peter Gülzow DB2OS, for proof checking and suggestions.

Low-Cost P3D Antenna Setup

These three antennas are perfect for everybody.

Assembling a satellite ground station can take many paths, and with the advent of the "Phase 3-D era" (P3D), the amateur satellite operator has even more options. The advice common in the last several years may be considerably "dated," as it is most often targeted at Low Earth Orbit (LEO) satellite operation or the venerable AO-10, which often have conflicting requirements. P3D offers the opportunity to do things a little differently.

resented here are a trio of antenna designs ideally suited for the P3D operator on a budget, or perhaps one with an inclination towards home-brewing. These designs are just one combination of suitable solutions and are not intended to describe the optimum system, but merely one that will work well for a minimum investment.

Introduction

One of the most often cited obstacles to entry into the world of amateur satellites is the cost of the large and expensive U/V array typical of an "OSCAR-class" station. These large arrays are de rigueur for many serious satellite operators to work AO-10, where 15 to 18 dBi gain is needed to communicate reliably at apogee. But does P3D have these same requirements?

These antennas are elementary and scalable designs. They are practical, easily replicated, and inexpensive to build. Included are a pair of beams for 2 meters and 70cm and a novel helix design for 13cm. The builder may choose to employ fixed circular polarity, or use switchable polarity.

These antennas are designed with the AMSAT-DL recommendations as a prime guideline, and are smaller than the "OSCAR-class" ones mentioned above — much smaller. This smaller

size leads to less gain. Less gain means wider beamwidth. Wider beamwidth allows less-critical pointing. The inference one may make is that automated (and expensive) tracking is not mandatory for P3D. To this end, I offer below designs that will all fit within an imaginary 5' by 5' (1.5m x 1.5m) box,

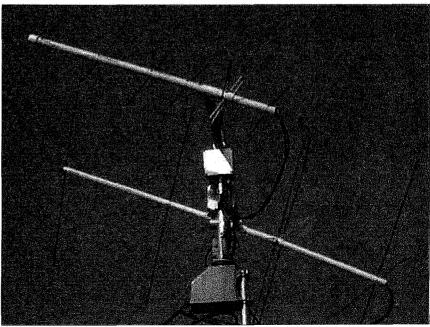


Photo A. The UHF/VHF beams during "field trials."

First published in the Proceedings of the 15th AMSAT-UK Colloquium, July 2000.

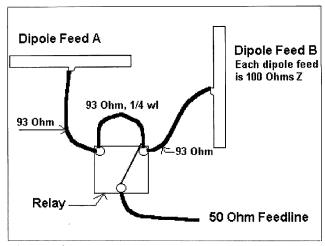


Fig. 1. Basic feedpoint configuration of beam antennas.

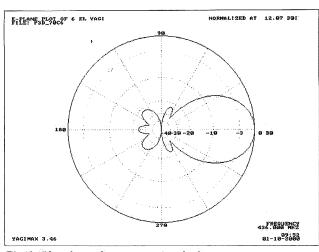


Fig. 2. 70cm beam free space azimuth plot.

and can be controlled with TV-type rotors or pointed manually.

While designed with P3D parameters in mind, these antennas are suitable for all classes of satellites, from LEOs to P3D to AO-10. They have a little too much gain to work LEOs without elevation control, but they have no problem working any current LEO if pointed at it. They do not have quite enough gain to work AO-10 at perigee, but they easily work it out to 30,000 km.

Modes of operation

combination in use today for LEOs, but not likely to be as popular for P3D. The numerous U/V stations equipped for AO-10 will likely be the initial contingent to populate P3D. Very quickly, though, mode U/S is staged to become the preferred combination (followed by L/S in a few years). For the transition to mode U/S it will be quite easy for the AO-10-equipped station to simply add a mode-S downconverter using VHF as the IF. Perhaps the idle AO-13 stations will dust off the gear and become active again. For the new P3D station builder, a Mode V/U is the most prevalent | 2 meter antenna may even be superfluous!

With the preceding in mind, I will describe three antennas designed and built as prototypes in January 2000. The antennas were tested for only a short period, as the author had to leave for an extended stay in Russia. The results for the beam antennas were exactly as expected; the author worked stations on RS-13, AO-27, SO-35, AO-10, FO-20, and FO-29 over a three-week period and confirmed the modeled performance for gain and F/B ratio. The results for the mode-S helix are less conclusive, as the testing was limited to a few weekend passes of OSCAR-11 and one pass of UO-36 with the S-band beacon energized (Merlion operation).

UHF/VHF beam design considerations

The effort began as a design exercise. The original design criteria for the 70cm and 2 meter antennas were (in order of importance):

- 1. circular polarity;
- 2. gain of at least 10 dBi (per AMSAT-DL); and
 - 3. F/B ratio of at least 20 dB.

I started with the intent of using 3 x 3 elements on 2 meters and 4 x 4 on 70cm. Modeling, however, quickly showed me that I needed 4 elements to reach the 10 dBi goal and still have a dimensionally tolerant design with acceptable bandwidth. Once committed to a 4 x 4 design on 2 meters, I opted to increase the 70cm design to 6 x 6 elements since I had the physical space now defined by the 2 meter antenna's

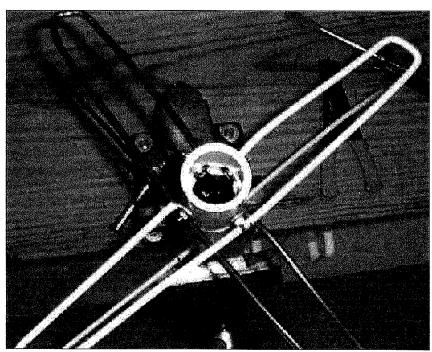


Photo B. 70cm beam feedpoint arrangement inside a PVC coupling.

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boom. Both antennas were systematically developed using K4VX's Yagi-Max 3.46, verified for behavior in NEC4Win95, and empirically tested using available analog satellites.

The antennas are designed as linear Yagi-Uda beams, but employing a folded dipole driven element and a phasing line for circular polarity. The physical construction of the folded dipole driven element provides a 4:1 transformation of the nominal dipole feedpoint impedance.2 Thus, the antennae are designed with a 25 ohm dipole feedpoint, but constructed with a folded dipole element, resulting in a 100 ohm feedpoint impedance. Then, two of these linear beam antennas are coupled together in parallel fashion via a 93 ohm (RG-62) coaxial cable, producing a summed feedpoint impedance of (approximately) 50 ohms. Circular polarity is effected through a 90 degree phase shift inherent in a 1/4 wavelength section of coaxial cable. This simple, effective scheme is shown in Fig. 1 and described in detail in The Radio Amateur's Satellite Handbook.3 The 70cm antenna produces approximately 12 dBi of gain with a 24 dB F/B ratio, and the 2 meter antenna produces a very respectable 10.6 dBi gain with a 23 dB F/B ratio.

UHF beam construction. 6 x 6 elements

The prototype antenna is constructed

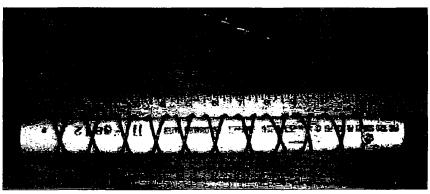


Photo C. Double helix during assembly.

using 3/4" (19mm) PVC piping and #10 AWG insulated copper wire [0.1" (2.5mm) diameter of conductor]. The dimensions are given in Table 1.

As is visible in Fig. 3. I did not have elevation control available for testing the antenna, but I did manage to work quite a few low-elevation passes of various LEOs with moderate success (with the antenna set at about 15 degrees elevation). I made it into SO-35's very(!) competitive transponder at the northern LOS with this antenna, whereas I could never accomplish that feat with my "everyday" TPM II.4 I was also able to work AO-10 with ease out to 30,000 km using 100 watts, working both New Zealand and Europe from Texas with 55+ signals on SSB (between the fades, of course).

VHF beam construction — 4 x 4 elements

This antenna was also constructed using 3/4" (19mm) PVC piping, but I recommend using 1" (25mm) material, as the boom sag on the prototype was noticeable. The elements are fabricated from 1/4" (6.35 mm) copper tubing, the kind used for refrigerator water hookup. This material is very soft and easy to work with, but would not be suitable for areas where snow is a frequent visitor. Aluminum tubing or 3/16" (5mm) rod are commonly available and would make better candidates for a longterm-use antenna. The driven element is formed using #10 AWG insulated wire. The nominal dimensions are given



Element	Length (in./cm)	Distance (in./cm)		
Reflector	13.375/34.0	0.0/0.0		
Driven Element	12.450/31.6 (x2)	5.75/14.6		
Director 1	11.935/30.3	11.00/27.9		
Director 2	11.875/30.2	16,00/40.6		
Director 3	11.815/30.0	23.50/59.7		
Director 4	11.685/29.7	32.00/81.3		

Table 1. 6-element UHF beam (x2) dimensions.

Low-Cost P3D Antenna Setup

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in **Table 2**. If 3/16" rod is used, follow the dimensions given in **Table 3**.

AO-10 performance, the real test for a 2 meter satellite antenna, was outstanding, as the ability to switch circular polarity made this the better performer when directly compared to my 7-element horizontally polarized antenna.⁵ On uplink, I could reach beacon strength on CW into RS-13 with 5 watts. I really hated to take this antenna down.

Mode S double helix — 10 turns

This antenna started life as an educational endeavor. I wanted to experiment with a design concept at 70cm and then scale it "down" to 13cm. The original idea was to construct a pair of concentric helices with one left-hand circularly polarized (LHCP) and the other right-hand circularly polarized

PLANE PLOT OF 4 EL YACI NORMALIZED AT 18.64 DBI

90

189

189

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189

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199:276

199:277

191:7969:277

110:2666

Fig. 3. 2m beam free space azimuth plot.
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(RHCP). The premise was that the two helices, at 180 degrees out of phase, would be invisible to each other. I built the first prototype at 70cm to test the operation with the rudimentary instrumentation at my disposal (SWR and field strength meters), then tested it on the air.6 This effort proved successful enough that I constructed a 13cm version using the AF9Y "ring reflector" design.⁷ This uncommon design was first proposed by the originator of the helix. W8JK.8 An early version of the 13cm helix was used to verify the operation of my Drake 2880 (courtesy of G3RWL, thanks!) using OSCAR 11 as the signal source.9 This first antenna was a "single" helix, but I was still able to copy OSCAR 11's beacon with ease. The design parameters are depicted in Table 4, as developed using VK5PGT's Helix 5 software program. 10

This is a small antenna. It is constructed on a 12" (31cm) section of 1" (25mm) PVC pipe (see also the G3RUH and WØOQC designs in reference no. 5). Ten turns of insulated #14 AWG wire are wound 180 degrees apart at the 1-1/16" (2.7cm) spacing shown in Fig. 4. The ring reflector is spaced 1-1/4" (3.2cm) behind the first turn and the feedpoint is directly behind the ring reflector, as shown in Fig. 4. Two helices are wound and fed on opposite sides of the pipe.

The double helix proved to have more than enough gain to repeatedly hear OSCAR 11 at an S2-S5 when pointed straight on to it (I did not have

elevation control). The rated 16.5 dBi gain is hard to verify (and is the subject of considerable doubt), and the beamwidth appears to be in the 45-60 degree range.11 The F/B ratio also does not appear to live up to published figures, as I could detect a fairly strong signal off the back lobe.

The ability to

Element	Length (in./cm)	Distance (in./cm)		
Reflector	39.375/100.0	0.0/0.0		
Driven Element	38.400/97.5 (x2)	17,0/43.2		
Director 1	36.500/92.7	36.0/91.5		
Director 2	36.250/92.1	56.0/142.2		

Table 2. 4-element VHF beam (x2) dimensions (1/4" tubing).

Element	Length (in./cm)	Distance (in./cm)		
Reflector	39.750/101.0	0.0/0.0		
Driven Element	38.400/97.5 (x2)	17.0/43.2		
Director 1	37.830/96.1	37.0/94.0		
Director 2	37.560/95.4	58.0/147.3		

Table 3. 4-element VHF beam (x2) dimensions (3/16" rod).

Frequency	2401 MHz				
Axial length	10-7/16" (265 mm)				
Turn spacing	1-1/16" (25.6 mm)				
Helix diameter	1-7/16" (27 mm)				
Pitch angle	13 degrees				
Length of wire	9 ft. 7-3/4 in. (2.94 m)				
Beamwidth	38 degrees				
Impedance	130 ohms				

Table 4. Double helix design parameters.

switch circular polarity proved interesting, as I found only about a 6–9 dB difference on OSCAR 11, but it was easily 20 dB or more on local "noise" (DDS dishes). **Photo D** shows the double helix, the weatherproof box holding a coaxial relay, and a Drake 2880 downconverter. Each helix's feedpoint is cabled out to one port of an SPDT relay, and the relay common is cabled to the downconverter.

Subsequent efforts to model this design in NEC4Win95 required use of the "virtual" version, capable of an unlimited number of segments. ¹² 1 used 16 segments per turn and soon learned that the antenna is far from an optimal design. For those wishing to improve this rudimentary design, a significant improvement in both gain and pattern can be made by tapering the coils from back to front in both diameter and pitch. This modification, however,

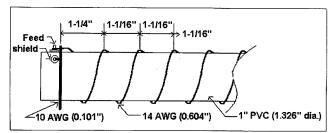


Fig. 4. Double helix configuration.

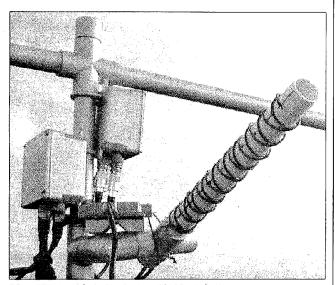


Photo D. Double helix during "field trials."

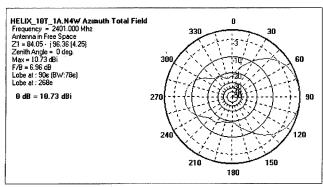


Fig. 5. Double helix free space azimuth plot.

obviates the original intent of simple construction on a common piece of pipe. Fig. 5 is the gain pattern for the built and tested version. You will note that the observed poor F/B ratio was confirmed in the model, and interestingly, the impedance match and the gain were both better at 2200 MHz: 1.7 SWR at 17.25 dBi.

Conclusions

These antennas are small and inexpensive to build, and promise to be

Their small size contributes to their intrinsically wide beamwidth, allowing the ground station to employ either simple az/el controls or possibly even manual pointing. A computer-based automated tracking system need not be a concomitant appliance. For USbased operators, they are good candidates for portable Field Day operation with "Armstrong" rotators. For those interested in viewing more detailed color photographs, please see: [http:// members.aol.com/ k5oe].

effective for P3D.

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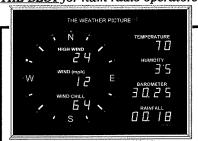
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Cruising for Satellites

If you can get away with it, this is the best of both worlds.

How do you go on a family vacation and still have time to make dozens of satellite contacts? Take a cruise! A typical vacation is actually a lot of work, and there is rarely a moment to escape into ham radio.

If your vacation involves travel, that usually means driving or flying. If you are driving, there is a chance that you can set up for mobile satellite operation. I have been experimenting with this type of operation for over 20 years, with many successful contacts. The mode "B" (70cm up and two meters down) transponder on AMSAT-OSCAR-7 and the mode "A" (two meters up and 10 meters down) transponder on AMSAT-OSCAR-8 were excellent resources back then. The satellite receivers were quite sensitive,

and the transmitters were quite readable on the ground with the help of preamplifiers.

However, problems occur when you mix satellite chasing with vacation driving. It is not a good idea to drive while attempting satellite contacts. Unlike typical VHF/UHF FM operation, or even shortwave activity, satellite contacts require more focus on the radio. In addition to tuning in a station to contact, it is necessary to adjust the transmitter frequency to match the targeted downlink. Then, the effect of

Doppler shift will require constant retuning during the contact. Obviously it is better to make satellite contacts while stationary. The single-channel FM satellites are somewhat easier, but still require concentration. It's not always easy to explain to family members why you're pulling off the road to play with the radios. And since the satellites are only available for contacts when they are above your horizon, your operating schedule is strictly dictated by their availability.

If your vacation travel involves

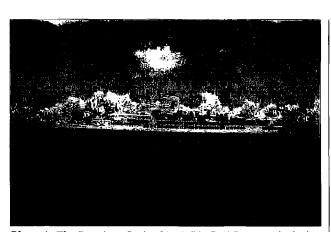


Photo A. The Premiere Cruise Line's Big Red Boat III docked at Cozumel, Mexico.



Photo B. Heather WB5RMA and Andy W5ACM celebrate their 25th wedding anniversary during the cruise.

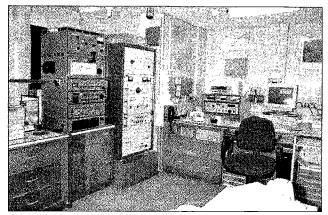


Photo C. The typically vacant radio room on the Big Red Boat III.

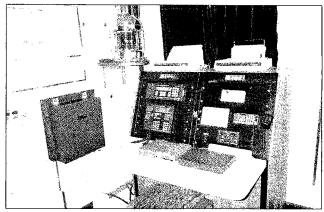


Photo D. The radio communications system on the bridge of the Big Red Boat III was well maintained.

commercial air travel, time for satellite chasing becomes extraordinarily limited. You can forget about making contacts on the way to the airport, in the airport, on the airplane, and during travel from the distant airport to your final destination. It doesn't happen. I've tried it.

When you get to your vacation destination, it's time to unpack, get oriented, check schedules, and, if you are visiting friends or relatives, sit down, talk, and socialize. You'll be really lucky to find some opportunities to get ready for a satellite pass and operate. If you do, you will likely have an audience of nonhams who will not be impressed by your ability to talk to other techno types on ham radio when a cell phone or the house phone would have been easier.

If your final destination is a remote cabin or campout, your time is not your own for other reasons. Taking care of "maintenance" chores tends to dominate free time. When you're not hiking, sleeping, or eating, it's time to plan, organize, or clean up. It's possible to break away for a few quick low-orbit satellite passes, but once again, there is usually an audience or something else that is not being done that is theoretically your responsibility.

It's cruise time

If you can make time while at home to pursue satellite contacts, you will be able to find even more hamsat time while on a cruise. Does this sound incredible? It's not. There are

some surprising reasons why you can easily make time to get on the air.

First, you are on vacation, a real vacation. The hardest part of a cruise is getting you, your family, and all your luggage on the boat. You may have to drive or fly to the port and, once you are there, stand in line, fill out forms, and hand over your plastic wallet stiffeners for scanning and bank account trimming.

Then, all of a sudden, you are on board. You find your cabin, discover your luggage outside your door, read about shore excursions and cruise events, check the eating schedule, and kick back. Your work is done. The next time that you will be a focal point of the outing will be when it is time to load your suitcases full of clothes in need of wash, and things that you and the family have purchased in foreign ports, into your UAV (Urban Assault Vehicle) or sedan.

Hamsats and the cruise

In recent years, cruises have become very popular. Before affordable air travel, the boat was the only way to visit foreign countries and islands. For most, the boat ride was just the means of getting from point A to B. Cruises today are not just the means, but a primary part of the vacation. Cruise ships are floating cities whose sole purpose is to provide entertainment and relaxation for the passengers.

The majority of cruise lines that work U.S. ports go to the Caribbean, Mexico, and Alaska. They have excellent musical acts, comedians, onboard pools, activities for kids, organized shore excursions, private cabins, gambling casinos, video arcades, formal events, spas, exercise equipment, movies, and phone and Internet access. Some even have satellite TV. But most of all, they have lots and lots of food and free time. If you're going on a cruise, start



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Photo E. Heather WB5RMA takes the wheel during a bridge tour.

planning your after-the-trip diet now, but don't bother to hold back while on board. It's not worth it. You will really miss out if you don't indulge in the multi-course meals.

Between ports of call, these boats spend a lot of time on the water. This is when you are supposed to calm down, enjoy, and do nothing. Personally, I am not that interested in hanging out in a floating bar or leaving all of my cash in a casino. I enjoy the entertainment, the food, the shore trips, and shooting skeet from the rear deck. I also find satellite contacts from remote locations fun and relaxing. You live on the boat for the duration of the cruise. There are many opportunities to sit in

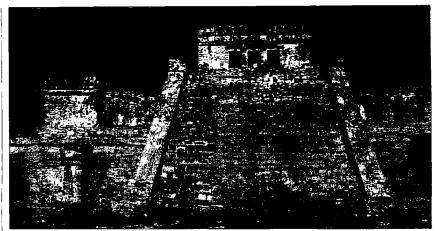


Photo G. The Mayan ruins at Tulum in Mexico were incredible.

a lounge chair on an upper deck and tune the FM satellites like AO-27 (AMRAD-OSCAR-27) and UO-14 (UoSAT-OSCAR-14) with an HT (handie-talkie). If you work it right, other members of your family or group will hardly notice if you catch a few passes each day. Unless they harbor anti-ham thoughts about your hobby, they may actually be impressed and interested.

While celebrating our 25th wedding anniversary on a cruise to ports in Mexico. Heather WB5RMA took care of logging station callsigns on a few passes. My oldest son Collin took pictures for this article, and my youngest son Brett enjoyed plotting GPS coordinates on a map.

Permission to operate

Three years ago we went on a Carnival cruise to the Caribbean. The ship was registered in Panama, so I went by

the ship's radio room to see if they had any problems with my proposed HT operations while on board. They didn't. In fact they were rather surprised and interested that I intended to make contacts via ham-radio satellites while on their ship. I was warned, however, not to operate during times when the ship would be using the VHF and UHF communications gear, i.e., when approaching or leaving port and during any emergencies.

While on our anniversary cruise on the Premier Cruise Line's Big Red Boat III [http://www.bigredboat.com] last summer, I went by the radio room twice, but no one was home. There were instruction sheets on how to make phone calls from your cabin, and a stack of blank FAX sheets for those who didn't quite succeed at leaving work behind. This boat was registered in Nassau (other Premiere boats are registered in the Bahamas, Panama,



Photo F. Food sculptures are typical on cruises.24 73 Amateur Radio Today • October 2000



Photo H. Andy W5ACM makes another UO-14 contact from a rare grid square in the Gulf of Mexico.

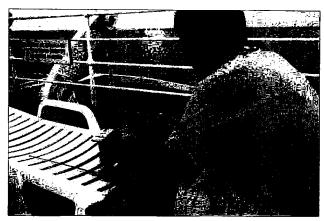


Photo I. Andy W5ACM checks the GPS receiver with a Palm VII, while on the cruise.

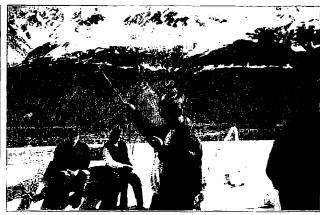


Photo K. Lee KQLEE made over 120 contacts while on an "inside passage" cruise to Alaska.

and Liberia), and I decided that it was better just to go ahead and ask forgiveness later, if necessary, and start operating. On this trip, I noticed that there were a lot more folks with cell phones, FRS (Family Radio Service) HTs and GlobalStar satellite phones. Since I didn't have a big HF rig, and didn't start stringing up dipoles, I almost fit right in. Note that it can be rather entertaining to listen in on the FRS frequencies (462.5625-462.7125 & 467.5625-467.7125 MHz in 25 kHz steps) in between satellite passes.

Unless you take the time to apply for licenses in the countries where the ship docks, don't plan on operating on shore. The rules and regulations of the foreign ports are not ignored just because you showed up on a cruise. It also won't fit your schedule. Time is limited in port. Make the most of it. There are sights to see and things to do that you may never have another

chance to see or do again. Our cruise visited Vera Cruz. Playa del Carmen, and Cozumel, Mexico. I focused on the family, a submarine ride via Atlantis Adventures of Cozumel, and the incredible Mayan and Toltec ruins at Tulum and Quiahuixtlan respectively. I'm ready to go back!

Your shipboard station

It's possible to pack everything you need in a small camera bag. My system consisted of an Alinco DJ-580T dual-band HT, Diamond RH77B dualband 15" whip, MFJ 1712 telescoping dual-band whip (7.5" collapsed and 19" extended), Arrow II dual-band hand-held yagi [http://members.aol. com/arrow146/index.html], spare 12 VDC battery pack for the HT, the HT's charger, DeLorme Earthmate GPS receiver, Palm VII with Pocketsat and Solus Pro software, earbud headphones,

handheld microphone, spare batteries for the GPS unit and the Palm, a grid square map of the Gulf of Mexico and my AMSAT Satellite Frequency Chart. With the exception of the Arrow antenna, it all fit in the camera bag, with the tip of the Diamond antenna hanging out a few inches.

I intended to do some experiments with the different antennas, but found that the convenience of the collapsible MFJ whip made it the antenna of choice. It was easy to carry and use around the ship. The Arrow spent the whole cruise in a suitcase down in the kid's cabin. Had I gotten it out, contacts would have been easier, but I still managed to successfully complete over 100 QSOs from nine rather rare grid squares in the Gulf, using UO-14 exclusively (145.975 up and 435.070 down). I have since discovered the Pryme Model AL-800-BNC dual-band telescoping whip. It is 9.5" collapsed

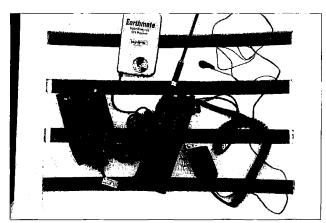


Photo J. The GPS receiver, computer, radio, and other accessories were compact, easy to use, and effective while on the vacation cruise.

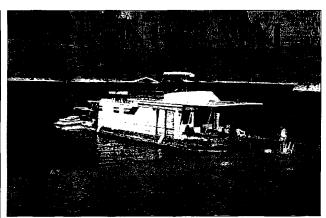


Photo L. Russ K5NRK's QSL card from his trip to Lake Powell in



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and 34" extended. It is a remarkable portable performer for satellite work.

The radio, an Alinco DJ-580T, was chosen because I was familiar with its operation. It has five watts out with the large (12 VDC) battery pack, and it is full duplex; I can transmit on one band while simultaneously listening on the other. I have been using it for portable FM satellite work since AMSAT-OS-CAR-21. Any dual-band HT that has a few watts out and can do full duplex will do well. Some satellite chasers have succeeded with a dual-band HT that is not full duplex, but it takes practice. The earbud headphones and the handheld mic are extremely useful when positioning the HT for the best signal, and avoiding feedback through the satellite.

Orbits and location

The biggest issue is knowing where you and the target satellites are at any given moment. One solution is to plot all of the orbits for all of the satellites you wish to work prior to the trip. This requires that you know the complete itinerary for the boat. Then you can print out all of the predictions using your satellite tracking program of choice. I have used GrafTrak from [http://www.rcallen. com] since there are still Y2K glitches with my version of InstantTrak. Location approximations are usually good enough. Adjustments can be made during the actual pass.

This time, I had a Palm VII with a very effective tracking program, PocketSal You can download a shareware version of PocketSat from [http:// www.palmgear.com]. The latest revision (V2.0) provides color support for those who have the Palm IIIc. The shareware version is fully functional, but limited to tracking five satellites at a time. This is quite adequate for those who only want to keep up with the FM satellites and a few others. The program's only deficiency is that it will not track AO-10, or other non-circularorbit satellites.

Prior to the trip, I put in a recent set of satellite elements and ran some predictions for the first day offshore. The results were identical with those plotted by GrafTrak. Whenever I wanted to check out some passes on the cruise, I put in the coordinates from my GPS receiver and let the program run. The GPS receiver was a key part of my gear. The DeLorme Earthmate GPS receiver [http://www.delorme.com] connects directly to the Palm. Using DeLorme's Solus Pro software, I could get my exact location quickly. Some GPS receivers will also provide the current grid square. Mine did not, so I also had a grid-square map from [http:// www.arrl.org]. Most of the operators on the FM satellites are grid square collectors. It's fun operating in uninhabited grid squares. You become rare DX.

I wasn't the only one

Other satellite enthusiasts were also riding the high seas during the summer. Lee Devlin KØLEE [http://members. aol.com/Lee810/ham.html] took the inaugural "geek" cruise [http://www. geekcruises.com] called the Perl Whirl. Lee used a Yaesu FT-51 HT and an Arrow II antenna to make over 120 contacts from 15 different grid squares. While making a UO-14 contact, Lee was interviewed by a writer from Wired magazine who was fascinated with the concept of using an FM hamsat to make contact with other hams in the lower 48, as well as a few Alaska regulars. Lee's cruise was through the Alaska "inside passage," and had other hams on board like Steve K4HG of APRServe fame [http:/ /www.findu.com] and Steve N4RVE [http://www.microship.com]. A fun feature of Lee's cruise was a flight on a DeHavilland Otter to a camp up the Taku River for a Salmon cookout.

Russ Tillman K5NRK (Vice President of AMSAT Publications) worked UO-14 as maritime mobile on the MV CPR while on vacation at Lake Powell in Utah. While he wasn't out on the ocean, a lot of the conditions were the same. During his week stay, Russ contacted over 20 stations using only a two-watt HT and a whip antenna. He is already making plans for vacation next year with gear for AO-10 (AMSAT-OSCAR-10), AO-27, FO-20 (Fuji-OS-CAR-20), FO-29 (Fuji-OSCAR-29), RS-13, UO-14, and possibly Phase 3-D

From Russia, With Satellite

"The name is Brown, Jerry Brown."

This is not a "how to" on operating satellites in a foreign country, but rather an informal accounting of one amateur radio operator's brief experiences in Russia. If you think you would like to operate satellites from another country, your first place to gather information might be the ARRL's Web site [www.arrl.org]. For information about operating in Russia, visit KØXO's excellent site at [www.rossiva.net/k0xq.htm].

had the opportunity to spend six months in provincial Russia earlier Lthis year (February through August), mostly in the formerly closed city of Dzerzhinsk (used to be called Gorky in Soviet times), about 500 km NE of Moscow. It took four months to acquire my Russian operating license from the Glavgossvyaznadzor Rossii (GGSN, the Russian version of the FCC) in Moscow (to see a copy of the GGSN license, go to: [http://members. aol.com/grbrownrussia/licensel.jpg]). That time was followed by considerable travel in-country to St. Petersburg, Moscow, and Krasnoyarsk (the Ural Mountains in central Siberia), leaving me with only a few short weekends for active satellite operation.

Operating conditions

I lived in a converted apartment building, now a hotel, the most common dwelling all over Russia. My 3rd floor room had a balcony, but unfortunately it only had exposure to the north and east. I was completely blocked by taller buildings from 130 degrees to 350 degrees azimuth. As you can probably imagine, Siberia and the arctic are not hot spots of amateur satellite | Photo A. Station setup.

activity. Still, many of the satellite footprints would reach into eastern Europe while the satellite was east of me.

My station consisted of a Yaesu FT-100 and three home-brew antennas: a 10 meter dipole, a 2 meter ground plane, and a 70cm Eggbeater II. (For further information on this antenna, see Brown, Gerald R., "The Eggbeater II Omni-direction LEO Antenna," The AMSAT Journal, Sept./Oct. 1999, pp. 14-16, or [http://members.aol.com/ k5oejerry/eggbeater2.htm]). You may think a nonduplex radio and simple, omnidirectional V/UHF antennas are far from optimum for satellite ground station operation, and you are right. But that does not mean that with a little work and persistence, you cannot make contacts and you cannot have fun. I sure did both!

The Yaesu FT-100 was an ideal rig for my little DXpedition. It allowed me to work HF (my main interest was the IARU HF World Championship), work satellites in "split" mode (albeit,



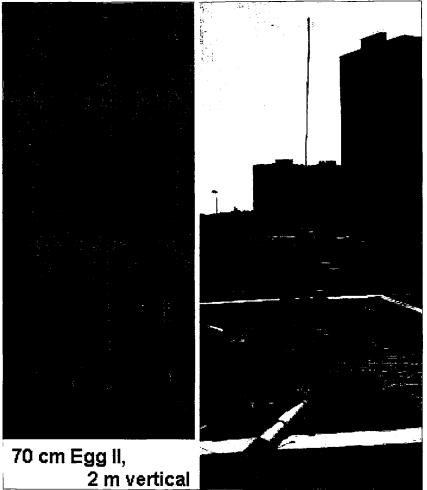


Photo B. V/UHF antennas on the balcony.

not full duplex), and is small enough to carry in my hand luggage, along with a tiny MFJ MightyLite power supply. One

pleasant surprise was the effectiveness of the DSP in FM mode — not a feature my full-size rig at home has available.



Photo C. My Russian QSL card.

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The antennas were also small and portable, but these were carried in my checked baggage. I used nothing more than some PVC pipe and common house wire for the antenna construction. The 9913F coax for the 70cm antenna was the heaviest and bulkiest item in my portable station arsenal.

Working the easy ones

I thought the FM birds would be easier than in North America, simply due to less "competition." I also thought AO-27 would be my best choice. I was wrong on both counts.

The QRM on AO-27 was horrific! I never made a single successful QSO on that workhorse mode J satellite. As the bird came over my northern horizon, the uplink is captured by what appears to be a 2m CW beacon, although I could never discern what intelligence lay behind the seemingly random characters being sent (no, it was not RS-12/ 13). As the bird moved down over central Siberia, FM broadcast music dominates the downlink, with an occasional strong Russian station able to break in and make a call. I heard a few successful Russian OSOs, but never heard any from Scandinavia or Europe.

UO-14 was a different story. I found contacts easy and plentiful on this recently activated mode J satellite, including several with some old AO-10 friends. It was a real treat to hear familiar calls like LY3BH, OZ1MY, and ONIDLL on a Low Earth Orbit (LEO) satellite! Unfortunately, the FM LEOs don't offer the opportunity for ragchewing like AO-10. My biggest regret was not being able to hear the bird when it was west of me, giving me the opportunity to QSO with old AO-10 friends from Italy, France, and the UK. 1 never heard SO-35 turned on over Russia.

Working the SSB satellites

The SSB satellites are my preferred form of satellite communication, affording more time to have a pleasant conversation and getting to know the operator on the other end a little better than is possible on the rapid-fire, ever-so-popular, FM birds. Making

successful contacts on SSB using a nonduplex rig involves using one, or both, of two techniques:

- 1) Calling CQ and scanning a range of the expected downlink passband. This was effective on RS-13 and FO-20, where the SSB "calling frequencies" are fairly standard at 29.480 and 435.850 MHz, respectively. Using mode A (2 meter uplink). I received nice signal reports from UR4MSP and SMØNJO on RS-13. This method is often employed by mode K (15 meter uplink) operators using their HF rigs. Since FO-20 has a much higher altitude than the other amateur LEOs, I made my one and only central European contact with IW1HX on this, my very favorite satellite.
- 2) Guessing/estimating the Doppler shift and responding to another operator's call. This technique often requires a quick response, checking to see if you are heard, then adjusting your uplink by 1 kHz or so, then responding again. This worked for me on AO-10 and I had a nice QSO with LY3BH on this bird also. Not bad for an omnidirectional antenna, a nonduplex rig, and only 20 Watts uplink power!

Da svedanya

After just getting into the swing of satellite operating on weekend mornings, my work assignment was cut short and I returned home to Texas earlier than planned. Still, the opportunity to work amateur satellites in a foreign country was memorable and exciting, managing two-way phone contacts with the following countries: Germany, Lithuania, the Ukraine, Denmark, Finland, Sweden, Kazakhstan, Russia, Poland, Belgium, and Italy. If you have the opportunity to travel to some foreign locale, consider how much fun you can have working the amateur satellites with small, portable systems and simple, omni-directional antennas. If you are interested in viewing more detailed color photographs, please see: [http://members.aol.com/ k5oel and click on the "Russian site" link.

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PATENT PENDING

Inside Digital TV/VCR Tuners

Part 2: Data transmitter for testing.

This is part two of a series of seven discussions regarding the operation and use of digital TV/VCR tuners. Part one discussed the two types of digital tuners and provided a brief overview of frequency synthesizers as used within a digital tuner.

transmitter that I used to control the digital tuner during the study and testing of the tuner. To test a digital tuner, it is necessary to generate a clock stream and data bits, and to provide an enable signal on three

control lines providing input to the tuner. There are a variety of ways that can be developed to provide the control. Those conversant with digital techniques, microcontrollers, and computers will perhaps find them to be the easiest to implement as a controller. In

digital techniques hardware, I chose to develop a simple data transmitter from readily available parts. While considering the design of the data transmitter, it became evident that I'd need a way of testing its operation once it was constructed. Therefore, a data receiver was also developed, but it isn't a necessary item for exercising the tuner. However, it does provide a visual display of the data sent to the tuner, which is a boost to your confidence level. The data receiver will be discussed in the next part.

The concept of the data transmitter is to side-load the required tuner control data into shift registers and then

my case, a person less conversant with

The concept of the data transmitter is to side-load the required tuner control data into shift registers and then serially clock the data into the tuner. Fig. 1 shows a block diagram of the data transmitter. This is essentially the same process that would be accomplished by a computer, but in this case, most of the "work" is done manually. Fig. 2 shows the schematic for the transmitter, including the use of a clock counter and anti-bounce start circuit. A single anti-bounce clock switch could be used for clocking data and eliminate the need for the counter portion of the data transmitter. Without

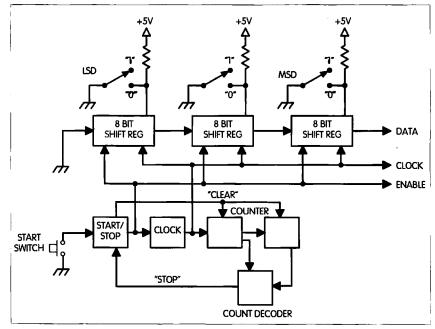


Fig. 1. Block diagram of the data transmitter. Each shift register is side-loaded with 8 bits of data.

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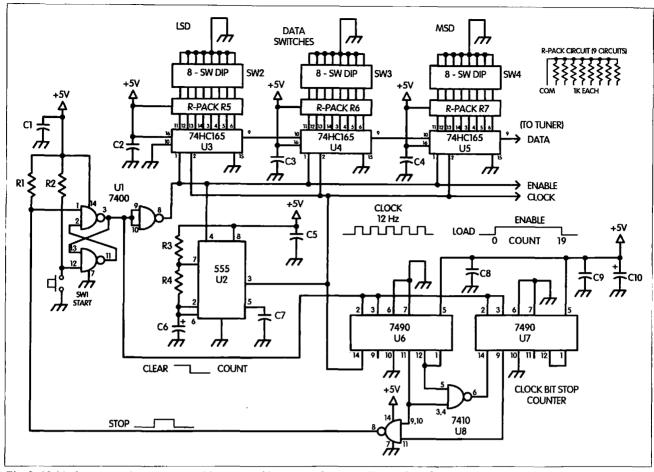


Fig. 2. 19-bit data transmitter generates binary serial bit stream for controlling a digital TV/VCR tuner.

the counter, the operator would have to keep track of the number of clock pulses being provided.

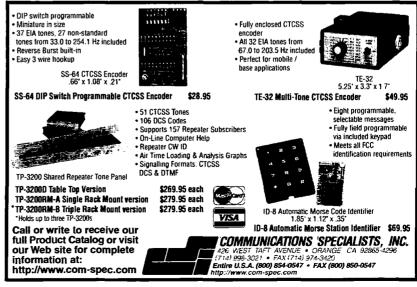
Side-loading of the registers is accomplished using dip switches. I chose to use three 8-switch dip switches and operate them inverted so that electrical "on" is down and up is "off." The objective was to provide a solid LOW at the input of the register for a "0" input. When switched "off," a pullup resistor pulls the node to +5 volts for a logic HIGH.

From an operator's perspective, the switches are down for a data LOW and are up for a data HIGH, which eliminates the confusions of switch logic. In other words, up is a "1" and down is a "0".

At first, I tried using standard TTL 74165 shift registers in the initial design, and found them to be very sensitive to glitching problems. I was unable to resolve the problem even after performing troubleshooting using an oscilloscope and a logic analyzer. The tests failed to show up the reasons for glitching. By switching to the 74HC165 part, the circuit settled down and behaved as expected.

Clock

A 555 running at approximately 12 Hz is used as a clock generator. The



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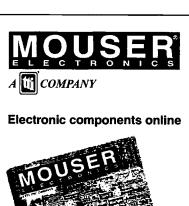


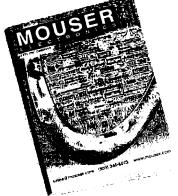
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	U7								
Pin #	71	8	9	12	11	œ	9	12	Clock
Function	Đ	С	В	A	D	C.	В.	А	COM/
	0	0	0	0	0	0	0	0	0 (Reset)
	0	0	0	0	0	0	0	1	1
	0	0	٥	0	0	0	1	0	2
	0	0	0	0	0	0	1	1	3
	0	٥	0	0	0	1	0	0	-4
	0	0	۵	0	a	1	0	1	.5
	0	0	0	0	0		1	0	6
	0	0	0	0	a	1	1	1	7
	0	0	0	0	1	0	0	0	8
	0	0	0	0	1	٥	0	1	9
	.0	0	0	1	1	0	1	0	10
	0	0	1	0	1	0	1	1	20

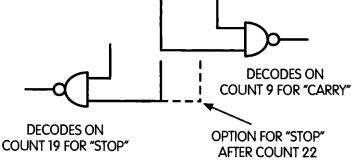


Fig. 3. 7490 IC binary counter and decoder scheme used in the data transmitter.

choice of clock frequency was quite random, and may be at whatever speed is desired by the operator as long as it doesn't exceed 100 kHz. When operating the tuner on the workbench, the low clock speed seems to be adequate. Running it faster did not enhance or detract from the study of the tuner. Starting and stopping of the 555 is accomplished by raising and lowering pin 4, which is the 555's control pin.

Before using pin 4 for start-stop control, I tried free-running the 555 and then gating the output through a logic gate. Although the process worked to some degree, the results were a little unpredictable. Switching the control to pin 4 of the 555 provided positive control over the clock.

Counter

Even though clocking the data manually worked OK, I chose to make the clocking more automatic by using a counter to create a "stop" function at the end of the selected count sequence.

To achieve a bit stream count in the range of 18-20 bits, a pair of 7490 decade counters was selected and connected to operate in cascade. Because 7490 counters do not provide a carry output that is desired to drive a second stage, only a count of nine is obtained from the first counter, instead of the normal ten. The second counter in the chain is the "10s" counter. It is capable of counting to 100, but is stopped at the end of the 19th clock pulse. Decoding

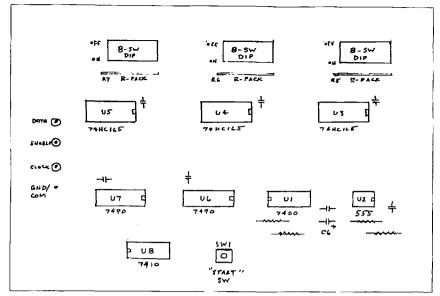


Fig. 4. Component placement for the data transmitter.

the counter from pin 9 of the second counter and pin 11 of the first provides a stop pulse, after the 19th clock, which is transferred back to the antibounce start gate, stopping all operations. Picking up pin 9 from both counters provides a "stop" after the

Parts List for Data Transmitter					
R1, 2, 4	4.7k 1/4 W resistor				
R3	2.2k 1/4 W resistor				
R5, 6, 7	1k R-pack Bourns 4610X-101-102 9-pin SIP or equiv.				
C1, 2, 3, 4, 5, 7, 8, 9 0.01 µF 50 V disc ceramic capacite or equiv.					
C6 10 μF 16 V radial lead capac equiv.					
C10 100-500 F 16 V radial lead capacitor or equiv.					
SW1	SPST momentary push switch, any type available				
SW2, 3. 4 8-pin SPST DIP switch					
U1	7400 quad 2-input gate				
U2	555 timer IC				
U3, 4, 5	74HC165 8-bit serial shift register: NTE 74HC165, Digi-Key 296-2098- 5-ND, Mouser 511-M74HC165				
U6, 7	7490 decade counter IC				
U8	7410 triple 3-input gate				
Misc	IC sockets				

Table 1. Parts list for the data transmitter.

end of count "22", should the extra clock counts be desired.

A truth table, shown in Fig. 3, was developed to provide visualization of which IC pins to "pick," both for coupling the counters as well as to determine the "stop" bit.

During the counter development, it was unknown which counter pins to use to obtain the desired STOP count. Therefore, to accommodate a variety of decoding schemes, a 7410 triple input gate was selected and is shown in the schematic. However, in the final circuit only two inputs were required for each decoder. If desired, a 7400 two-input gate may be used as a replacement for the 7410, with the appropriate pins being accommodated.

Output circuit

Tuner communication is provided through three wires connected to specific functions generated within the transmitter. The ENABLE line is also the register's LOAD line, which allows the shift registers to be sideloaded with tuner control data when the ENABLE line is LOW. Raising the ENABLE line allows the data to be clocked through the registers into the tuner. There is a "two clock bit" data displacement between a transmitter switch position where it ends up within the tuner's register. Accommodation of

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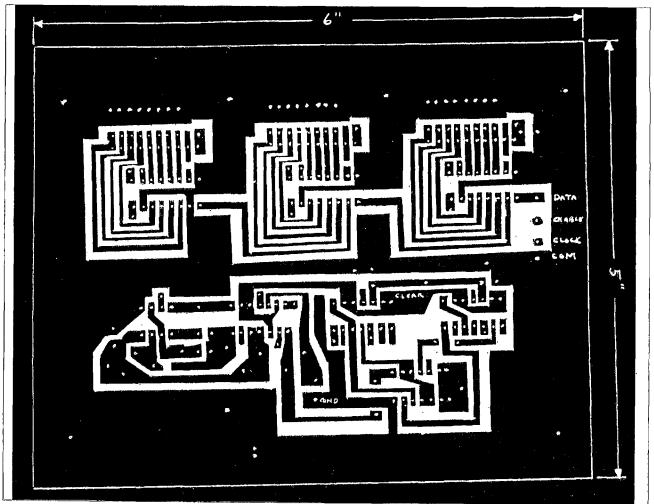


Fig. 5. PCB top foil side.



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the displacement is handled by shifting the data entry position appropriately on the data switches until the data lands into the correct register position. Techniques for finding the correct position are discussed later.

Data output for the tuner is obtained directly from the serial output port of the MSD shift register. To prevent an accidental entry of a "1" in the LSD position during clocking, the LSD register's serial input port is grounded.

A direct output from the 555 provides the clock signal for all of the transmitter functions as well as for the tuner. Buffering of the clock line to the tuner was not required because the 555's output driver will drive a large number of logic loads. However, a clock buffer may be added to the circuit if the user desires.

Packaging

Packaging of the data transmitter was done on a double-sided printed circuit board, where as much ground plane as possible was left on the board. The component placement for my data transmitter is shown in Fig. 4. The parts list is shown in Table 1. Although circuit board construction may not be required for the project, after noting the 74165 glitch issue that occurred, I'd recommend a board if one can be made. In the absence of a suitable board, direct wiring of the circuit may work if the 74HC165s are as glitch tolerant as they appear to be. I used IC sockets on my board so that I could switch ICs around while troubleshooting the glitch issue. I've not observed an issue with the use of sockets on my board.

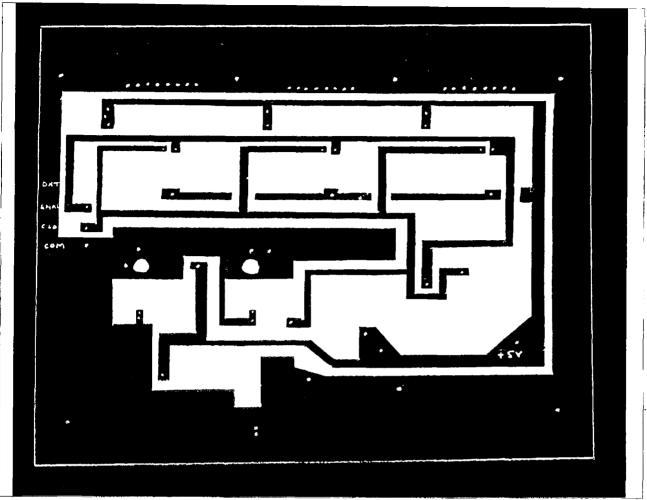


Fig. 6. PCB bottom foil side.

The lower side of the board carries the logic circuit, while the top side carries the clock, enable, and power circuits. Jumper wires were used to complete power circuits that became trapped by logic circuits. "Z"-wires were used to connect power and ground circuits between the two board sides.

It is necessary to provide as much ground plane as possible on the board and use an ample number of bypass capacitors. Bypassing IC Vcc terminals to ground with capacitors having short lead lengths reduces the possibility of logic glitching. At least one or two high value filter capacitors should be used on the Vcc line as well.

Part six of this series will show a procedure and details for making the printed circuit boards for the data transmitter. The procedure described is simple and provides reliable boards.

The next part of the digital tuner series will discuss the data receiver and then be followed by a discussion of how to interrogate and test digital tuners.

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OSCAR-10 Antenna System

A look at the high end of the antenna spectrum.

My satellite station is what is generally considered to be an OSCAR-10-class station. That means that I have long boom circularly polarized yagis with remotely switchable polarization, tower-mounted GAsFET preamplifiers, elevation and azimuth rotators, and high quality coaxial cable. Although many people operate satellites with very small antennas, this is a discussion of the high end of the antenna spectrum. I use this with a Yaesu FT-736R, which many people consider to be one of the best satellite rigs ever built. I have never used the digital satellites, so this discussion will be limited to use of the analog satellites on the VHF and UHF bands.

s of this writing there are six such satellites — three FM "bent pipe" repeaters (UO-14, AO-27, and SO-35), and three analog transponder satellites (AO-10, FO-20, and FO-29). In its current configuration, my station is overkill for the FM satellites, works very well for FO-20 and FO-29, and is marginally adequate for AO-10. If all the predictions about P3D become true, it will work very well for P3D.

As any station is only as good as the weakest link, I will go through each of the parts of the antenna system. This will include some discussion about how or why each component was selected, how it's used and installed, and, in some cases, some different points of view. I will also discuss changes that I would like to make in the future.

The antennas

For antennas, I am using KLM's long boom circularly polarized yagis. For 2m, this is a 22-element crossed element—type yagi (11 elements in each plane) on an 18-foot 10-inch boom. The 430 antenna is a 40-element crossed element—type yagi (20 in each plane) on about a 12-foot boom.

Although these antennas are no longer manufactured, they are not overly hard to find on the used market. For many years, they were considered to be the top end commercially manufactured circularly polarized satellite antennas for 2m and 430 MHz. I bought my antennas from the estate of a silent key. If I were to purchase new antennas today, I would undoubtedly go with the M² antennas, as they are fine antennas and the best currently available manufactured antennas of this type. **Photo A** shows the two antennas as they currently are mounted.

The mounting boom

One of the perpetual discussions about satellite antennas is what kind of mounting boom to use. The purists will tell you that a crossed element—type CP yagi must be mounted on a nonmetallic boom with no conductor of any type (including the feedline) in the antenna pattern. And they are right — to a point. Yes, there will be pattern disruptions by having a metallic boom or other conductors in the antenna pattern. Will you notice a difference? Most likely not — or if you do, it won't be much of a difference.

I have used my current antennas on both a nonmetallic boom and also a steel boom. When I first put my current antennas up, they were mounted on a 12-foot-long wooden boom of 1-inch dowel. This was chosen largely because I happened to already have it. The wooden boom worked OK, but flexed far more than I was happy with. The next step was to install a 2-inch steel mast section about 7 feet long coaxially over the center of the wooden boom, with the mast section well secured to the boom. This gave the strength of the steel and still did not have a metallic boom in the antenna pattern.

This worked out very well and would still be in use today, had I not broken the wooden mast. Hint: Don't rotate the antenna through 180 degrees of vertical rotation from inside the shack (where you can't see the antennas), while your work ladder is blocking the antenna travel. Rotator one — boom zero — time for new boom. After breaking the boom, I used what I had lying around that day, which was a Radio Shack 10-foot mast (R.S. part #15-848). Mechanically that works fine, and I have not really observed any difference in antenna performance. When

I get my tower up and relocate these antennas, I'll likely go back to using a nonmetallic boom, however.

Rotators

If you are installing a large antenna array, you will need to rotate them in both azimuth and elevation. With a short yagi, it is possible to get away with only using azimuth rotation, but long yagis are directional enough that azimuth-only rotation is very limiting. Although there are several options available for the person wanting to put something together, the only currently available commercial product I know of is the Yaesu G-5500 El/Az rotator combination. It's designed for the purpose and it works very well. If you have any thoughts of computer control of the rotators, bite the bullet and get the Yaesu rotator combination. It's designed for it.

If you buy a Kansas City Tracker, it comes with a cable already wired for this rotator as well. I originally used a rotator that, while it was a fine rotator, was not well suited for interface-tocomputer control. After almost completely rewiring it, I still could not get it to work right. The problem was that the position sense wire in the control cable was also used for one side of the AC power to the brake release. Although the resulting 4 volts of AC hum did not bother the front panel meter at all, it played heck with the analog-todigital converter in the Kansas City Tracker. I finally gave up and bought the G5500, and am very happy with it.

Preamps

Remember the old ham adage, "You can't work 'em if you can't hear 'em"? This is as true on satellites as anywhere else - if not more so. Although a tower-mounted preamp is normally not required for the FM satellites, and only occasionally on FO-20 and FO-29, it is highly recommended for AO-10. A preamp mounted at the antenna or tower top will make up for even a quite long feedline run.

Make sure that you get a preamp that has built-in relay switching. I am using the preamps from Advanced Receiver

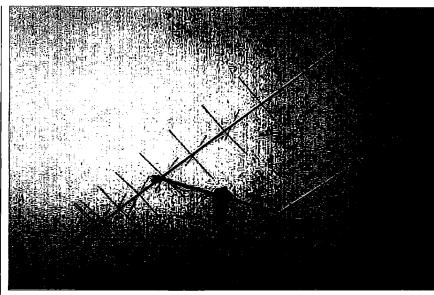


Photo A. Here are the two antennas as they currently are mounted.

Research. Several other companies build fine preamps that will perform very well for the purpose. The preamps I am using are not designed for outside mounting, so I have them mounted in an outdoor electrical box. The box is mounted just below the rotators. The preamps are controlled from in the shack. Photo B shows the electrical box with the two preamps installed in it. The preamps are stacked one behind the other so that only the 2m preamp is visible. On the left wall of the box is a terminal strip that connects the power wires to the preamps and the phasing cables for the antennas to a cable down to the shack, where a switchbox I built controls the preamps and antenna polarity phasing.

Support mast

At this time, I am using the bottom three sections of a Radio Shack 36foot push-up pole (R.S. part #15-5067). This is sitting on a base piece set in concrete and clamped to the eve of my house at about at the 15-foot level. The height of the mast was adjusted so that the back end of the 2m antenna just clears the peak of the roof when the antennas are pointed straight up. Each joint between mast sections is pinned. This is highly important, as the rotational torque of the large antennas mounted at the ends of a long cross boom will cause problems if the mast sections are not pinned. Do not depend on a friction clamp. One problem with a satellite antenna installation is that it is not possible to guy the mast very close to the rotators, as the guys would foul the antennas when they are pointed up. On the other hand, there is little need to put the antennas very high. Unless there are local obstructions, adding height only adds feedline loss. For this reason, I have the mast no higher than needed.

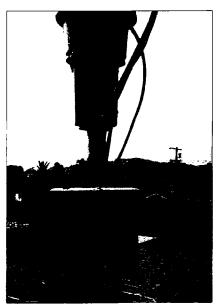


Photo B. The electrical box with the two preamps installed in it.

Roger J. Cooke G3LDI The Old Nursery, The Drift, Swardeston, Norwich, NR14 8LQ UK

Satellite Gateways

Time you tried one?

The terrestrial packet network has been with us now for over 15 years and it now seems to be in a decline. There are several reasons for this decline in popularity. At its peak, packet radio was new, no other mode existed like it, and it was a great time for experimenting to see just what could be done. Once established, with links and nodes, passing traffic became more of a service. With the explosion of the Internet, and mobile telephone networks, a lot of the magic of amateur radio has gone. However, there are still some of us "old-timers" who still try to maintain the status quo, and to try to make the amateur network evolve further. Unfortunately some of the original founding amateurs who started the data revolution have also deserted the sinking ship!

tions have put an immense amount of work into designing, building and launching numerous satellites over the years. The latest one, Phase 3-D should be in orbit and working by the time you are reading this. This will expand the horizons of a lot of amateurs who are unable to erect large antenna systems in their back yard. Communication across continents should be commonplace and for a large percentage of the day, regardless

of propagation. There are also several Low Earth Orbiters that have been tirelessly working and orbiting the Earth for a number of years. These are the satellites that are of interest to the Data enthusiast, and in particular Uo-Sat-OSCAR-22. This satellite is the one used for the transfer of data from the terrestrial network up to UO-22 and back down again when it appears on the other side of the globe. It is a very satisfying feeling to know that amateurs here can pass mail in this way on

earth, but even this has declined in popularity, largely due to a migration to the Internet and E-mail. I hope that by describing the system, we can encourage more amateurs to use amateur radio for amateur traffic and help support a system that can evolve to even greater things.

If we don't do this, there are greedy commercial eyes looking at our VHF/UHF bands right now and rubbing their hands. If those frequencies are "sold off" we will never get them back again. This is a classic case of "use it or lose it." Anybody can pick up a telephone.

System Hardware

Radio — As the data link operates full duplex, it is necessary to have either two transceivers, or one that can operate both bands simultaneously. The modern ones, such as the FT-847, can do this, so this simplifies the radio requirement. I run the Icom 271/471 combination and it works just as well.

Antennas — The uplink to the Pacsat is on 2 meters and the downlink is on 70cm. Obviously signals are not enormous, so some gain is needed. The

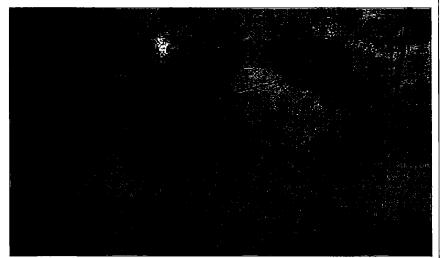


Photo A. Author's antenna system.38 73 Amateur Radio Today • October 2000

minimum requirement for the uplink frequency is something like a 10xy, preferably arranged and phased to give Right Hand Circular Polarisation (RHCP). For 70cm a multi-element beam can be used, or a 16-turn helix. James Miller G3RUH, produces a kit for a 16-turn helix, and it works very well, is easy to assemble and has a very low SWR when tuned correctly.

These antennas are mounted on a 9 ft. boom and, in my case, the whole assembly is on top of a 25 ft. home-made tower. The assembly has to be rotated in azimuth and elevation and for this I use a Yaesu G-5600B rotator combination. I use Landwehr preamps, also mounted on the top of the tower and the feeders, which should be as short as possible, are a piece of LDF-250 for 70cm and UR-67 for 2 meters. My feeder length is about 35 ft., as the tower is just outside the shack. There are many variations on this theme of course, but this is about the average installation. My antenna system can be seen in Photo A.

TNC/Modem — The TNC is the old version 1 Tiny-2, running in KISS mode together with a 9600 baud modem, which in my case is the G3RUH modem. This I mounted in a similar box to the TNC and put this on top of the Tiny-2. Connections are straightforward and easy to do. However, these days, there are 9600 baud units all ready to go, and these can be used with no construction time needed.

Computer — This can be anything from a 386 upwards, preferably not less than a 486 however! It is actually much easier to run two computers, networked together. The Satgate runs on one and this talks to the other, running the BBS. For example, in my case I have a 486 100 MHz for the Satgate, and a Pentium 150 for the BBS.

Control - Running all this equipment every day for a large percentage of the day, it is essential that the satellite is tracked on the nose, and also the radio(s) are moved in frequency to compensate for Doppler shift. On a Low Earth Orbiter (LEO) such as UO-22,

Doppler can move the frequency some 15 kHz.

In order to automate the system and save Sysop time and worry, there has to be a method of controlling these parameters. The TrakBox is one such way, and was designed by JA6FTL of Jamsat. It is a stand-alone unit, supplied as a PCB, and has to be built and mounted in a box. With a weekly feed of Keplerian elements, it tracks up to 16 satellites and controls the radio gear, compensating for Doppler shift. For more information about TrakBox. E-mail Fred Southwell G6ZRU at [g6zru@amsat.org].

Another method is the PCB from Dave Lamont ZL2AMD. This is a PCB that mounts inside the PC, does not use a COM port and is conveniently out of the way. It does a similar job to the TrakBox and takes up less room, plus it saves an IRQ. Contact Dave Lamont ZL2AMD, 510, Kennedy Road, Napier New Zealand 4001;

Continued on page 40

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Software — Most amateur computers now use Windows 9x and this is the platform that most Satgates use. It's possible to run both the BBS and WISP software on one machine, but it is easier to use two PCs, networked together. The main BBS program will be F6FBB 7.00g. This runs on one PC, taking the messages from the terrestrial network and forwarding them to a file in a directory in the root of the BBS PC. These come from VHF/UHF and in my case also HF as I run an HF Gateway, too. At a pre-determined time the Satgate PC collects these files and processes them prior to a pass of UO-22. The Satgate PC runs a program called WISP, written by Chris Jackson G7UPN/ZL2TPO. Chris works at the University of Surrey. This continuously tracks many satellites and priority can be given to certain satellites. In the case of the Gateway, priority will be given to UO-22 over all other satellites. If you are tracking KO-25 for example and UO-22 came within range, the gear would leave KO-25 to go and track UO-22.

Prior to the pass, the mail is processed to conform to the protocol used, and a similar post-pass processing 40 73 Amateur Radio Today • October 2000

takes place. The mail is then passed to the BBS computer. All this processing software is written by Andrew Sellers G8TZJ. Andrew is pictured in **Photo 2**.

WISP automatically updates the Keps when downloaded from UO-22. These are normally uploaded to the satellite on a regular basis so are usually the latest set. However, it is also possible to subscribe to receive them weekly on the Internet. Obviously it would be a manual job then to update. UO-22 also updates the computer clock; the satellite itself is updated from a very accurate source. When tracking satellites, the Keps and the time are extremely important. WISP satellite tracking software can now be obtained from AMSAT NA for \$60 for members and \$70 for nonmembers. Application should go to AMSAT, 850 Sligo Ave. #600, Silver Spring MD 20910, tel. (301) 589-6062.

For updating the TrakBox with the latest Keps, and also for station details such as latitude and longitude, callsign, etc., Procomm is used.

Setup — Wiring of the hardware is fairly straightforward. Checking out the SWR on the antennas is very important, as is the alignment of the antenna system. I use the Pole Star to

align the antennas. The only disadvantage is that it has to be done at night, so I usually do it in the summer!! Once the software has been loaded and set up correctly, and this can take quite some time, tracking of one satellite can be attempted. I cannot stress enough the need to have the computer clock as accurate as possible, the latest Keplerian elements, and the antennas aligned properly. It will take a few attempts to see any visible data from the satellite, but once that happens, it is very satisfying indeed.

Problems will occur

There is no perfect system, so don't be discouraged if the first few attempts end up as a big zero! There are quite a few Elmers around to ask if you have any queries, and you will have, believe me! Don't be afraid to ask, we all had to.

The satisfaction you will achieve at sending a message this way, whether it be direct or via a Satgate, is much greater than that obtained from using the telephone, so even if you don't intend to set up a satellite station yourself, please try to make use of the Satellite Gateway network. In the short time I have run a Satgate, some three years now, I have noticed a decline in traffic, and that old saying springs to mind — Use it or lose it! Never has this been truer. In fact, as I have been writing this, I received a letter from AMSAT UK, confirming my opening paragraph, suggesting that youngsters these days are only interested in the Internet. Membership of AMSAT UK is now one-third of what it was ten years ago. The very existence of AMSAT UK is now threatened, and it won't be long before this happens in the USA, too.

We can all try to stem the flow and encourage activity, and this is the reason for this article. If I have encouraged just one person to try satellite communications, this article will have been worthwhile. So, next time you send an E-mail to a UK amateur, try the Satgate first. That is where amateur traffic should be, anybody can use a telephone. Think before you link!!! See you on the birds!

CALENDAR EVENTS

Listings are free of charge as space permits. Please send us your Calendar Event two months in advance of the issue you want it to appear in. For example, if you want it to appear in the December issue, we should receive it by October 31. Provide a clear, concise summary of the essential details about your Calendar Event.

OCT 8

DIMONDALE, MI The Central Michigan ARC. and the Lansing Civil Defense Repeater Assn., will sponsor "HamFair 2000" at The Summit. 9410 Davis Hwv., Dimondale MI (just minutes from Lansing), 8 a.m.-2 p.m. Vendor setup starts at 6 a.m. VE exams at 10 a.m. (ARRL VEC), 9:30 a.m. registration. Walk-ins welcome, but pre-registration is strongly recommended. First come, first served. E-mail [n8vys@voyager.net]. DX Forum with Bil W8EB, and Ron ND5S, at 10 a.m. See and hear the story of their annual trip to St. Maarten for the ARRL International DX Contest, where they operate as PJ8A. An ARRL Forum will be presented at 8:30 a.m. The Enforcement Forum is a must-see for anyone with questions on how the job gets done, and what Riley Hollingsworth of the FCC has planned for 2000 and beyond. Advance tickets \$5, \$6 at the door: 12 and under admitted free. Advance tables \$10.50, \$12.50 at the door. Please contact *J*. Ervin Bates W8ERV, P.O. Box 80106, Lansing MI 48908; Tel. (517) 676-2710; E-mail [w8erv@arrl.net]. Hotel accommodations at the Holiday Inn, 7501 W. Saginaw Hwy., Lansing. Call (517) 627-3211 and ask about "the Special Summit rate of \$68 per room!" Fax (517) 627-5240. Located only 10 minutes from the Summit, take Exit 93B.

MEDINA, OH Join the M2M Group for the all new 2000 Medina County Hamfest, Sunday, Oct. 8th, at the Medina County National Guard Armory, 920 W. Lafayette Rd., 1/2 mile west of the fairgrounds. Vendor setup at 6:30 a.m. Open to the public 8 a.m.-2 p.m. Talk-in on 147.030(+). Computer equipment, new and used ham gear. VE exams, contact Fred at (440) 236-3477. Walk-ins always welcome. Indoor tables. Limited outdoor flea market spots available on a first-come first-served basis. General admission \$5 per person at the door or \$4 in advance. Vendors \$9 in advance, \$10 per table on the day of the event. For more information about tickets and registration, please call Mike at (330) 273-1519.

OAKBROOK TERRACE, IL The Chicago ARC, Inc. Hamfest will be held 8 a.m.-1 p.m. Vendors setup at 7 a.m. Go to the entrance at Park View Dr., north from Cermac Rd. (22nd St.), one block west of Route 83. Advance tickets \$4, \$5 at the gate, rain or shine. Enclosed parking lot, open on one side. Free parking and selling spaces. Bring your own

tables. Contact George at (773) 545-3622; or Dean at (708) 331-7764; or write to CARC, P.O. Box 410535, Chicago IL 60641-0535; or CARC, 5631 W. Irving Pk. Rd., Chicago IL 60634.

WALLINGFORD, CT The 8th Nutmeg Hamfest & Computer Show, and the ARRL Connecticut State Convention, will be held Sunday, Oct. 8th, 9 a.m.-3 p.m. at the Mountainside Special Event Facility, High Hill Rd., Wallingford CT. Exit 15 Rte 91 (North or South). Follow signs. Vendor setup starts at 6 a.m. Some of the features of this event are: Indoor and outdoor vendors and private "tailgating" sales, seminars, lectures, demonstrations, VE exams. For VE info call N1JEO at (203) 235-6932. General admission is \$6, children under 12 \$3. This year the special quest speaker will be Wayne Green W2NSD speaking on "The Day Kruschev Saved Amateur Radio." ARRL speakers include Betsy Doane K1EIC, CT Section Manager; and Tom Frenaye K1KI, New England ARRL Director, Information is available on the Web at [www.qsl.net/ nutmeghamfest]. E-mail [nutmeghamfest @gsl.net]. Proceeds from the event will help support public service, scholarship and civic activities.

OCT 14

BREMERTON, WA The North Kitsap ARC will sponsor a Hamfest at President's Hall, Kitsap County Fairgrounds, NW corner of Fairgrounds Rd., at Nels Nelson Rd. Talk-in on 146.62(-) PL 103.5(-), WWRA rptr., or 146.52 simplex. Admission \$5, 12 and under 12 free. New and used equipment. Tables \$15 each, includes 1 free admission, until 9/30/00; \$20 each aferwards. Helpers to renters of personal tables (2 max.), \$4 each. Commercial spaces \$30 each. Electrical connection \$2 per table. Contact Marcie Stilwell KC7DAT, P.O. Box 2268, Silverdale WA 98383-2268. Tel. (360) 697-2797, or E-mail [nkarc@yahoo.com]. Info available at [www.silverlinkg.net/nkarc].

TAMPA, FL "Ham/Computer Fest 2000" will be presented by Egypt (Shrine) Temple ARA, at 4050 Dana Shores Dr., in Tampa. The location is Due West of the Tampa International Airport. Doors open 8 a.m.-5 p.m. Admission \$5 in advance, \$6 at the door. 8 ft. tables \$15 each. Tailgating space \$15. Everyone must have an admission ticket. Setup starts Oct.

13th after 1700 hrs. VE exams, all classes, by MOSI ARC, at 1300 hrs. There will be forums every hour starting at 9 a.m. Free parking, handicap accessible. Talk-in on 146.940. Contact Jay Strom at (727) 822-9107; or [K9BSL@iuno.com].

OCT 15

KALAMAZOO, MI The 18th Annual Kalamazoo Hamfest will be held Oct. 15th at the Kalamazoo County Fairgrounds. Vendor setup at 6 a.m. Doors open to the public at 8 a.m. Advance tickets \$3, \$4 at the door. Trunk sales \$5. For tickets/tables, send SASE to Charlie Burgstahler, 6658 Carlisle Dr., Kalamazoo MI 49001. For further info, fire up the modem and take a peek at [www.qsl.net/ka8blo/hamfest.html], or E-mail [charlieb@net-link.net].

QUEENS, NY The Hall of Science ARC Hamfest will be held at the New York Hall of Science parking lot, Flushing Meadow Corona Park, 47-01 111th St., Queens NY. Vendor setup at 7:30 a.m. Buyers admitted at 9 a.m. Free parking. VE exams at 10 a.m. Admission by donation — buyers \$5, sellers \$10 per space. Talk-in on 444.200 rptr., PL 136.5, 146.52 simplex. For further info, call at night only: Stephen Greenbaum WB2KDG (718) 898-5599; E-mail [WB2KDG@Bigfoot.com]; or Andy Borrok N2TZX, (718) 291-2561, E-mail [N2TZX@webspan.net]. VE info only, Lenny Menna W2LJM, (718) 323-3464; E-mail [LMenna6568@aol.com].

OCT 21

GRAY, TN The 20th Annual TriCities Hamfest will be held on Saturday, Oct. 21st, at the Appalachian Fair Grounds, located off I-181 in Gray TN. A large drive-in indoor and outdoor flea market space is available. RV hookups. Admission \$5. The hamfest is being sponsored by the Kingsport, Bristol, and Johnson City Radio Clubs. Mail inquiries to *P.O. Box 3682 CRS, Johnson City TN 37602*.

RICKREALL, OR The Mid-Valley ARES is proud to present its 6th Annual Swap-Toberfest, Amateur Radio Emergency Services Convention. The convention will be held Saturday, Oct. 21st, at the Polk County Fairgrounds in Rickreall. Doors will be open

CALENDAR EVENTS

continued from page 41

for the convention from 9 a.m. to 3:30 p.m. Swap table setup will be from 6 p.m.-8 p.m., Friday night, Oct. 20th, and on Saturday morning, Oct. 21st, at 7 a.m. Self-contained RV spaces available. Talk-in on the 146.86 rptr. Features include: Swap tables, commercial dealers, meetings and seminars. Additionally, emergency communications vehicles will be on display from Marion and Polk County Emergency Management, Civil Air Patrol, American Red Cross, the Oregon State Police. and others as available. For more info, contact Bud Smith WA7FJF, (503) 838-0266, or E-mail to [wa7fif@arrl.net]. To download a copy of the flyer and pre-registration form, surf the net for [http://www.teleport.com/~n7itf/swaptobe.htm].

WATERFORD, CT An auction will be held by the Tri-City ARC, Oct. 21st, starting at 10 a.m., at the Senior Citizens Center, Waterford Municipal Complex, Route 85, south of Exit 77 oft I-395, or north of Exit 82 off I-95. Setup at 9 a.m. Handicapped accessible. Bring your items to be auctioned. Talk-in on 146.97. For more info, contact Austin J. Wolfe AA1SV at (860) 443-2459; or at [aa1sv@downcity.net].

OCT 22

SELLERSVILLE, PA A Hamfest, sponsored by the RH Hill ARC, will be held Oct. 22nd at Sellersville Fire House, Rt. 152, 5 miles south of Quakertown, and 8 miles north of Montgomeryville. Talk-in on 145.31. VE exams 10 a.m.-1 p.m., all classes. Bring documents. Indoor spaces \$12 (table included), outdoor \$6, bring tables; admission \$5. Hamfest Hotline: Linda Erdman, 2220 Hill Rd., Perkiomenville PA 18074; tel. (215) 679-5764. Web site [HTTP://WWW.RFHILL.AMPR.ORG].

OCT 28, 29

UMATILLA, FL The Lake ARA will hold its Hamfest and Computer Show at Olde Mill Stream RV Resort, 1000 N. Central Ave., Umatilla FL; tel. (352) 669-3141. 40 ft. x 60 ft. RV lots available @ \$18 per night, with utilities. Admission \$5 per person. VE exams, walk-ins only, at 10 a.m. Talk-in on 147.255. Inside tables \$10, includes one admission ticket. Tailgating \$7 per vendor. Contact Chuck Crittenden KE4EXM, P.O. Box 615, Altoona FL 32702; tel. (352) 669-2075. E-mail [capias@gate.net].

OCT 27, 28, 29

PORTLAND, ME The 18th AMSAT-NA Space Symposium and Annual Meeting will be held at the Holiday Inn Portland West, 81 Riverside St., Portland ME, Oct. 27–29. *Tel.* (207) 774-5601, 800 HOLIDAY, Fax (207) 774-2103. Convention rate: \$78 per night, reference AMSAT Convention when making reservation.

Holiday Inn courtesy shuttle available from airport to hotel. US Air is offering a discount fare for the convention. AMSAT's Gold File #73171596 must be referenced when making reservations. US Air (800) 428-4355, or call AMSAT's travel agent, Jim O'Neil at (800) 322-7032 ext 151. Advance registration after Sept. 15th is \$30, at the door \$35. Saturday Night Banquet \$25. Make checks payable to AMSAT-NA in \$US. Send to AMSAT, 850 Sligo Ave. #600, Silver Spring MD 20910-4703. For further info, tel. (301) 589-6062; Fax (301) 608-3410; E-mail [martha@amsat.org].

OCT 29

CANTON, OH The Massillon ARC will present their 40th Annual Hamfest at Stark County Fair Grounds, all indoors and heated. Setup at 6 a.m. Doors open at 8 a.m. Take 1-77 to downtown Canton, then follow W Tusc. or 4th St. west to the Fair Grounds. Talk-in on 147.18(+) Club rptr. Tickets \$4 in advance, \$5 at the door. 8 ft. tables \$10 with electric. Mail requests for tables to Terry Russ N8ATZ, 3420 Briardale Cr., Massillon OH 44646; tel. (330) 837-3091; or E-mail [MARC.HAMCLUB@ JUNO.COM]. Visit the Web site at [WWW.QSL. NET/W8NP]. An auction will begin at 10 a.m. 15% commission charged on all items sold. You may buy back your own articles at no charge. MARC has the right to limit the amount or type of items sold at auction.

NOV 4

LONDONDERRY, NH The Interstate Repeater Society ARC Annual Fall Flea Market will be held Nov. 4th at the Londonderry Lions Club on Mammoth Rd. Space is limited, so reserve it now. E-mail reservations to [Harold@ neainc.com]; or call Paul at (603) 883-3308. This event will be held rain or shine. There will be over 35 tables inside, and room for more undercover outside. Electricity is available to 13 of the 35 tables. \$2 discount to the first 10 people to provide their own table. After that it is \$10 per supplied table. Vendor setup is at 6 a.m. Early bird shoppers will be admitted 6 a.m. to 8 a.m. for \$10. Admission 8 a.m.-1 p.m. is \$3 each. Directions: Route 93 North to Exit 4 in NH. Top off the ramp left turn. Straight west on Route 102 until you pass Dunkin Donuts on the left, next light is Route 128, turn right. The Londonderry Lions Club is about a mile on the right. Talk-in on 146.850.

NOV 4-5

ODESSA, TX The West Texas ARC will host its "2000 Hamfest" on Saturday and Sunday, Nov. 4–5, at the Ector County Coliseum, 42nd and Andrews Hwy., in Building D. The hamfest will run 8 a.m.–5 p.m. both days. VE exams will be available. Free parking. Admission is \$3; tables \$10 each, with one free ticket per vendor. Contact Craig Martindale W5BU, 1719 Rosewood, Odessa TX 79761; tel. (915) 366-4521; E-mail [w5bu@hotmail.com].

NOV 5

MT. JOY, IA The 29th Annual Davenport Radio Club Hamfest/Computer Show will be held Nov. 5th at the Iowa National Guard Hangar, at the Mt. Joy Airport. Space is being planned for over 250 tables. Commercial vendors. Everything from parts to complete stations. Computer hardware and software. FSTV demo. No tailgating. No food or drinks may be sold. All tables must be rented through the club; bring your own chairs. Talk-in on 146.88/.28 alt 146.64/.04, no PL. Tickets are \$5 in advance, with double prize stubs, and \$6 at the door with one prize stub. Free parking. Under 14 admitted free, Lots of prizes, You need not be present to win. Hours are Sunday from 8 a.m. to 2 p.m. Main prize drawing at 1 p.m. Setup on Saturday from 12 p.m.-5 p.m. Sunday setup 6 a.m.-8 a.m. Advance tickets via mail only: Bill Bolton WBØBBM, 28755 Utica Ridge Rd., Long Grove IA 52756; E-mail [gemobile1@ aol.com]. For tables and tickets, contact Dave Mayfield W9WRL, 1819 7th St., Moline IL 61265; or E-mail [hamfest@ gw1td.com]. Tel. Saturdays, 9 a.m.-1 p.m. (309) 762-6010 and ask for Dave. Fax (309) 757-1880. When sending mail, include a business size SASE and make checks payable to Davenport Radio Amateur Club, or DRAC. Tables are \$12 each. If you need electricity, add \$1; first come first served.

NOV 11

GOLDEN, CO The 2000 Rocky Mountain Radio League, Inc. Hamfest will be held 8 a.m.-2 p.m. at Jefferson County Fairgrounds, 15200 W. 6th Ave., in Golden. Take the Indiana exit from 6th Ave. Talk-in on 144.62/145.22 MHz. Admission \$4 per person; tables \$10 in advance or at the door. VE exams, ARRL forum, refreshments, door prizes. Contact Ron Rose NØMQJ, (303) 985-8692, or E-mail [nØmqj@arrl.net].

MONTGOMERY, AL The Montgomery ARC will host the 23rd annual Montgomery Hamfest and Computer Show in Garrett Coliseum at the South Alabama State Fair grounds, located on Federal Drive in the northeastern section of historic Montgomery. Talk-in on 146.24/.84. W4AP. Ragchew on 146.32/.92 (with phone patch *up/#down), 147.78/.18, 449.50/444.50. Flea market reservations required to assure table. Tailgaters welcome, \$5 per vehicle space. For more info, write to Hamfest Committee, c/o 2141 Edinburgh Dr., Montgomery AL 36116-1313; or phone Phil at (334) 272-7980 after 5 p.m. CST. E-mail [k4ozn@ arrl.net]. Visit the Web site for late breaking news and events, [http://ischool.troyst.edu/ ~w4ap/J. Admission \$5; free parking. Inside flea market setup 3-8 p.m. Friday evening, Nov. 10th, and 6-8 a.m. Nov. 11th. Doors open to the public 9 a.m.-3 p.m. CST. VE exams

Mobile, Portable and Emergency Operation

Steve Nowak KE8YN/4 1011 Peacock Ave. NE Palm Bay FL 32907-1371

Murphy's Law and Disaster Services

If there's one time when Murphy's Law will reign supreme, it will be during the management of an emergency by ham radio operators. While most hams are ready, willing, and able to grab a radio or two and head for the action, there is no guarantee that things will go smoothly. In fact, the smart money is that anything that can go wrong will, and will do so at the worst possible moment.

Yow can this be possible? Well, one of the companions to Murphy's law is the Six P Rule which states that "Prior Planning Prevents Poor Performance." (I know that's only five Ps, but we hams, after all, must always behave as ladies and gentlemen.) These two issues are the reasons that emergency and disaster communications can be so complex and challenging. The basic reason is that although we expect amateur radio communication to be similar to our day-to-day operations, it bears little, if any, resemblance. In fact, it is the very fact that there is the illusion of similarity that makes it so challenging. Planning, very effective planning, is critical to our success during an emergency.

"What could be so different?" I hear people ask. "We use the same radio in the same way that we do every day." Well, actually the physical environment may in fact be quite different from that to which we are accustomed. We realize that instead of being in our own ham shack, we can expect to be located in some foreign area. It may be the on-scene command station, or the weather bureau. It may be the local police department or a shelter for evacuees. What challenges do these types of facilities offer? If they are set up for emergency operations, they should just naturally work out well.

It is important to remember that some facilities are intended for and designed to provide a place for communications. Others have a different primary duty and are pressed into such service only on rare occasions. This is what may create some significant problems. A commercial structure, for example, probably has significantly more steel in its construction and offers greater shielding against both transmitted and received radio signals. In Florida, with hurricanes being such a threat, many buildings that lend themselves to use as shelters,

etc., have metal shutters that are closed over the windows for protection. This provides a very effective Faraday shield, and radio operations may be almost impossible to maintain.

At home, I have several 2-meter rigs with external antennas and battery backup capability. I can hit most of my favorite repeaters with a handheld from at least one location within the house even if it takes a telescoping five-eighths-wave antenna. On the other hand, making a contact from within a closed shelter may be far more challenging.

At home, if my signal is a little weak, I can move to a better location for a better signal. In a disaster, someone may select the operating position for the amateur operator without any knowledge of radio requirements. The incident commander or the public service official will need to keep his or her communicator readily available and convenient to other resources and isn't concerned about the ham operator's needs. While we may think it's okay to run outside or up onto the roof to get a solid signal, others may perceive popping in and out of the area to be downright counterproductive.

The next great difference is the fact that in most phases of our hobby we are in "CQ" mode. This means that we are usually willing to communicate with any (or at least almost any) other ham who happens to be on frequency. During emergency communications, however, it is imperative that we are able to get a message to the intended recipient. This may require the ability to effectively contact a particular repeater rather than merely being able to hit the most accessible one. While relays are possible, every relay takes at least one additional operator away from some other possible duty, so it shouldn't be our first choice.

So, what do we need to do to minimize Murphy's hold on our efforts? First and

foremost, as mentioned earlier, we need to emphasize planning. It is critical to know who needs support where, and what the expectations are. As I've mentioned many times before, the next steps include identifying people who will be assigned to the various locations, and then ensuring that through nets, simulated emergencies, drills, etc., people practice what they will be called upon to do. Obviously, though, there's a piece missing — the equipment aspect.

It is true that we hams tend to have a fixation on our equipment. And, of course, every ham keeps a ready bag that has those supplies he or she will need in the event of an emergency. On the other hand, though, this tends to focus on a "one size fits all" mentality. Working in various hospitals for nearly thirty years has exposed (excuse the pun) me to the ultimate proof that such a focus doesn't work. If you've ever been afforded the opportunity to wear a hospital gown, you know that it can better be described as "one size fits nobody." While better than nothing by far, the equipment we take to an emergency may or may not work and probably will not be the optimal solution.

During storm warnings, people are advised to take shelter in an interior room away from windows. The very attributes that make a room safer during a storm also make the room less desirable as an operating location. Guess what kinds of rooms are usually selected to be used for shelters? Yep—internal rooms away from windows. A J-pole antenna made from 300-ohm twinlead is a great part of the emergency kit, and often will perform very well. Unfortunately, in the inner reaches of a commercial building, taping the venerable J-pole to the wall may not work any better than a rubber ducky.

Radio Direction Finding

Joe Moell P.E. KØOV P.O. Box 2508 Fullerton CA 92837 [Homingin@aol.com] [http://www.homingin.com]

USA Foxhunting Championships 2001 — Let's Start Planning Now!

Does your ham club enjoy putting on hamfests and conventions? Do the members like to host visiting DXers? Are you looking for a new club activity that can involve every member and build lasting friendships, both locally and around the world? If so, I have an idea for you.

I am seeking one or more clubs to organize and host the first-ever USA ARDF Championships of on-foot foxhunting, to take place about a year from now. If your club is already active in international-style foxhunting (also called foxtailing, foxteering, radio-orienteering and ARDF), you already know how it promotes technical skills, builds physical ability, and fosters camaraderie. Putting on large-scale radio-orienteering events can add even more excitement. Read on, and you'll see that it's something that any well-organized club can do. But first, a little background.

In many European and Asian nations, there is an annual cycle of ARDF competitions, as

prescribed by the International Amateur Radio Union (IARU). Local events take place throughout each participating country in the spring and early summer. Later in the summer, qualifying rounds are held in various regions of each country, followed by national championships. For instance, Deutscher Amateur Radio Club held the German ARDF Championships August 11-13 near Berlin.

After that, the national champions in each age/gender division travel to international competitions. In even-numbered years, it's the World Championships. This year, they are in Nanjing, China, from October 13th through 18th. Slovakian hams will host

them in 2002. In odd-numbered years, multination championships are held at the IARU Regional level. For example, next year's Region 1 (Europe and Africa) championships will be in France.

IARU Region 2 (North and South America) joined the international competition cycle for the first time last year. Prior to that, our involvement had been only as guests and visitors. It began when Kevin Kelly N6QAB represented USA at the Region 3 (Asia and Oceania) ARDF Championships in Townsville, Australia, four years ago.

In 1998, six USA hams (WB6BYU, KC7CGK, KE6HTS, KF6YKN, KE6OTF, and WB6OBB) formed the first USA team to travel to the ARDF World Championships, which were in Hungary that year. WB6BYU and other members of the Friendship Amateur Radio Society (FARS) then hosted the first-ever IARU Region 2 ARDF Championships in Portland, Oregon, during August 1999 (Photo A). "Homing In" for January 1999 described the 1998 World Championships and my October 1999 column covered the Region 2 event.

It wouldn't have been a "Region 2 Championships" in 1999 without at least two teams from the region competing. As of this writing, only USA and Canada have active ARDF programs in Region 2. (Know any hams in Central and South America? Encourage them to try it!) A team of five foxtailers from the Victoria, BC, area represented their country last year. They were led by Perry Creighton VA7PC, who is ARDF Coordinator for Radio Amateurs of Canada.

Based on lots of E-mail correspondence



Photo A. Group photo of the 1999 Championships participants in Portland in front of the dining hall. All had a great time, thanks to efforts of the organizers, sponsors, and volunteers.

in recent months, it's uncertain if the Canadian ARDFers will travel to compete outside their country in 2001. That's why the current plan is to have the first USA National ARDF Championships next year. If it turns out that Canada or other Western Hemisphere country (or countries) can field a team at that time, we'll petition IARU to sanction the event as the IARU Region 2 Championships, in addition.

It is an IARU tradition, expressed in the official rules, that foreign radio-orienteers are welcome to compete at national championships, and out-of-region radio-orienteers are sought at regional championships. These visitors compete as individuals, not in national teams. That's why Kevin N6QAB received a hearty welcome at the Region 3 Championships, where he joined a field made up of the region's teams from China, Korea, Japan, New Zealand, and Australia, plus visitors from Kazakhstan, Bulgaria, and Poland.

The Portland event last year drew ARDFers from Australia, Sweden. Russia, Japan, Bulgaria, Belgium, and Kazakhstan. Some of them were the best in their respective countries at the sport, so we learned a great deal from them. For instance, Panayot Danev LZ1US of Bulgaria and Rik Strobbe ON7YD of Belgium gave classes on the fine points of on-foot RDF and orienteering to all attendees. Rik, who has served as Interim Chair of the IARU Working Group in Region 1, also presented a session on organizing ARDF Championships and serving as judges thereof. According to Rik, quite a few European foxtailers are eager to come to the next large ARDF event in the USA.

Choose your forest

FARS-USA's home in Portland is an excellent location for ARDF. IARU's rules for ARDF Championships (available for download via link from the "Homing In" Web site) call for mostly wooded terrain with no more than 200 meters' elevation change on the course. A forest with a good trail system is best. Experienced ARDFers like to run cross-country instead of staying on the trails. In many places that's possible, although there are dense forests where it is very difficult to do.

IARU mandates that separate 2-meter and 80-meter competitions are to be held on separate days. They should be at different sites, or in different parts of a single large site. The Pacific Northwest has an abundance of outstanding possibilities. Other areas of the country, such as the woods of the northeast, the Appalachian Mountains, and the mosscovered trees of the south are quite good.

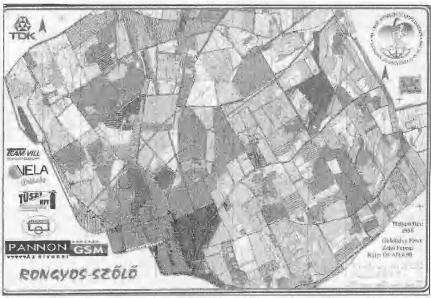


Photo B. Official map of one site at the 1998 ARDF World Championships in Hungary. Actual size of this multicolor map is 11 x 16 inches. Start (triangle symbol) is in lower left. Finish (bull's-eye circle) is near the center.

Even mountainous parts of desert states like Arizona and New Mexico have suitable radio-orienteering sites. The entire location doesn't have to be forested. Sometimes portions of championships courses include farmland or open grass. Every state probably has at least one site where an IARU ARDF event could be held.

The five fox transmitters must be more than 400 meters apart and at least 750 meters from the start. Straight line distance from start to each fox and to the finish should be five to ten kilometers. Depending on the skill of the hunters, you can use the terrain to add difficulty. On two meters, hills, water

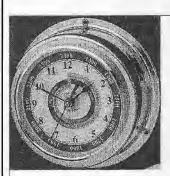
tanks, and other large features cause nondirect signal paths and erroneous bearings. This isn't true on 80 meters, so consider putting foxes near a lake or other large impassable terrain feature so the hunters must decide which way to approach to minimize their travel distance.

Site selection and course planning is a very important task, with many factors to consider besides terrain. For instance:

(1) Is this type of activity permitted at

the site? Make sure that off-trail running is OK. Secure permits, if needed, well in advance. If possible, make sure that other large groups won't be using the site at the same time. You may have to show evidence of insurance and specifically indemnify the site and its owners. I have found that obtaining permission isn't difficult if I hasten to point out that this is not a commercial venture, that we are not charging admission to spectators nor putting any area off-limits to others, and that we won't have any loud music.

(2) Are there any off-limits areas at the site, such as meadows with endangered plants? There are stables in one of our practice sites



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Photo C. Posting the results in near-real time is a nice touch, if you have sufficient volunteers to do it.

that hunters are told to avoid. The horse owners insist that our shiny RDF gear will scare their animals.

(3) Where will start and finish be? Putting them about 300 feet apart, as was done in Portland, eases the burden on organizers and staff because it's easy to move everything from one to the other as the hunt progresses. On the other hand, putting them at opposite ends of the site, as is typically done at European championships (see



Photo D. Don't forget first aid! Have supplies and at least one trained person on hand. Jackie Schaffer WA6AKP is treating a finisher at a recent southern California foxhunt.

Photo B), makes for a more challenging course. In the latter case, a foxtailer who misses a transmitter near the start must do considerable backtracking to pick it up if he/she discovers it near the finish. That's not true in the former case.

(4) Are both start and finish areas accessible by road with plenty of parking? Since you'll want to set up sun/rain shelters, water, first aid station, and so forth in both places, it shouldn't be necessary to carry supplies a long way.

(5) Good maps are a must. Many European foxhunting champions are also skilled orienteers, insisting on detailed topographical maps with contour lines at 20-foot elevation intervals. It may be possible to create suitable ones using USGS data from the Internet. Computer programs such as OCAD can also be used.

Maps are not given to the hunters until just before the hunt starts. It is also best if the site is not disclosed until the day of the event. This prevents competitors from trying to gain an unfair advantage by scouting it out, and it minimizes the likelihood that hiders will be observed while setting out the foxes.

Fox transmitters should be unattended. To prove that they found the transmitters, competitors carry a card that they mark with a unique punch at each one. Punches have distinctive patterns with up to nine pins. Standard punches and cards used by orienteers are suitable. Electronic systems that record the time of arrival at each fox have been introduced in Europe, but they aren't mandatory because the foxes can be found in any order.

International rules are very strict about timing of the five transmitters. Championship course foxes are on-air for exactly 60 seconds each in numbered sequence. all on exactly the same frequency. There's no dead air time between fox transmissions and no overlapping of transmissions.

To meet these requirements, you need a set of identical high-stability timers, one per fox. Two inexpensive devices, the Montreal Fox Controller and PicCon, make it possible to use almost any two-meter FM handietalkie or mobile rig, plus a heavy-duty battery, as a radio fox. Check the "Homing In" Web site or contact me for more information on them. You'll also need a sixth transmitter on another frequency, for a finish-line beacon.

Most first-time foxhunt organizers worry most about obtaining the properly timed transmitters. They're indispensable, of course, but they may be readily available for loan from a local ham or someone who will be attending. If you need to make your own, check the March and April 1998 issues of 73 to get "Homing In" ideas for reliable, inexpensive two-meter foxboxes. An 80-meter fox project is coming soon to this magazine.

Hotel or dorm?

When ARDF enthusiasts converge from many countries, it's important to have them stay close together and interact on a continuous basis to form lasting friendships. The cost of lodging and food must be low to make the event attractive to those traveling great distances, and especially to young competitors of modest means. Hotel accommodations are acceptable, but only if the price is right. Attendees at the 2000 ARDF World Championships in China are staying at the New Century Hotel in Nanjing, where IARU's negotiated rate is just US \$30 per person, double occupancy, including meals.

The most cost-effective accommodations are usually at schools and colleges. As an example, the 1998 World Championships were headquartered at a teachers' institute. For the 1999 Oregon event, FARS-Portland arranged for use of the dormitories and food services of Reed College, on its beautiful campus near downtown Portland. The rolling green lawns made ideal practice sites for ARDF during the get-acquainted time before the 80-meter and 2-meter competitions.

Here's a typical schedule for an International Championships:

Day 1 (afternoon): arrival, registration, orientation.

Day 2: training, practice, instructions, jury meetings, and order-of-start drawings.

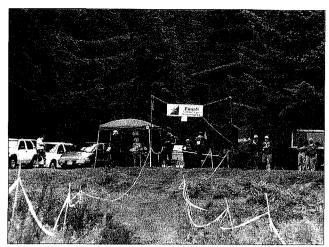


Photo E. IARU rules call for a contestant to run through a corridor to get to the finish line. This one was at the 2-meter event in Portland. Note the banner, courtesy of the local orienteering club. After finishing, they went inside to dry their shoes and socks around the fireplace.



Photo F. Medals can be a significant expense, as you may need lots of them. Here are USA's Junior Division champions at Portland. Left to right are Brian Peddicord KF6DZN, Jack Loflin KC7CGK, and Jay Thompson W6JAY.

Day 3: 2 meter competition.

Day 4: sightseeing.

Day 5: 80 meter competition and closing banquet.

Day 6 (morning): departure.

Typically, there is a day of rest and sightseeing between the two band competitions. Some competitors may choose to arrive on Day 2, but it will probably be necessary to charge them the full amount anyway, depending on your negotiated arrangements with the housing provider.

Besides lodging and food, arrange for a meeting room and social area. Consider having a special event ham station for visitors to operate in free time. Internet access would be a big plus, as visitors will want to send E-mail to their families and friends at home. One or more of the organizers should stay on-site continuously for the duration of the championships to help visitors, interface with facility management, and supervise minors.

It's likely that the competition sites won't be close to where competitors will be eating and sleeping. You'll need to arrange bus or carpool transportation for each competition day. That ensures that everyone arrives at the site on time with no lost souls. Box lunches for these days are in order.

It takes a team of volunteers to put on a well-run foxhunt. Timers at the starting line send off the hunters at exact intervals. Helpers at the finish line collect the cards and mark finishing time on them. Things can get hectic at these two locations, so two persons are better than one. You'll also need volunteers for scoring (**Photo C**) and first aid (**Photo D**). Remember, these positions do not require licensed hams.

Have course marshals scattered in the woods to watch over the activities. Contestants know they may not help one another in any way nor vandalize the foxes, but having these observers helps prevent temptation. Marshals should also be on the lookout for any health problems that might develop during the hunt. Don't station them near foxes — that would be a giveaway. Have them keep moving along. Encourage them to carry cameras to document the fun.

IARU rules require start and finish corridors from 50 to 250 meters long. Competitors run into the start corridor when released by the start timers. When they reach the end, they may turn on their RDF gear and take off into the forest. Try to find a natural corridor with the end hidden by trees or a hill. Similarly, the ending corridor funnels runners to the finish line (**Photo E**). It's good to have a spotter at the entrance to the finish corridor to announce via radio (the 70 cm band is ideal) to those waiting that runners are approaching.

ARDF is an amateur sport, so no cash prizes can be offered at national or international championships. It's traditional to have first-, second-, and third-place medals in all divisions for the best individuals and national teams on each band (**Photo F**). IARU presently has five age/gender divisions, so up to 60 medals will be needed, depending on the number of participants that register in each division. Medals are presented at the closing banquet by a VIP of IARU or the host society (ARRL in the USA). Every participant should also receive a certificate and a small memento of the event.

Let's get started!

Selection of sites and arranging for housing are substantial undertakings, but you don't have to do them alone. Your local Chamber of Commerce or Convention/ Visitor's Bureau may have good suggestions. The National Park Service and the forestry authorities in your state may be of assistance in site selection.

Get to know the leaders of your local orienteering club. They can probably supply the standard orange-and-white flags, stands, and unique punches for each fox, plus the competitor cards. They will also have excellent ideas for suitable well-mapped sites. They may even volunteer to assist with the event as course-setters, course marshals, and timers.

I have gotten excellent low-cost maps of sites in my area from the Los Angeles Orienteering Club. The Vic-Orienteers of British Columbia were instrumental in putting on the foxhunt for the 1993 Friendship Radiosport Games. Who knows — you might find some good ARDF prospects in your local O-club. In my area, the Caltech Orienteering Club holds annual radio-orienteering events on campus.

Sponsoring an international radioorienteering event isn't a money-making venture, but it shouldn't deplete the club treasury either. Carefully consider all the costs, set a reasonable price, and announce it well in advance. The basic price should include all housing, food, site transportation, and incidentals for the duration of the event. I think it's best to include the closing

NEW PRODUCTS

Mini-News from MJF

- The MFJ-269 SWR Analyzer covers 1.8 to 170 MHz and 415 to 470 MHz an MFJ exclusive. Large, easy-to-read, two-line LCD display and side-by-side meters clearly display your information. Built-in Ni-Cad/Ni-MH charger circuit, battery saver, low battery warning, smooth reduction drive tuning. Use as a signal source for testing/alignment. MSRP = \$359.95
- The RuftRider Tri-Bander, MFJ-1436, is 59 inches of stacked elements with high-Q phasing coils. 7.2 dB gain on 440, 4.5 dB gain on 2m. and 2.15 gain on 6m. Work all your favorite bands with one antenna! Factory-tuned for SWR less than 1.5:1 with 50 ohm impedance; handles 150W; 5 inch mag recommended, MSRP = \$79.95.
- MFJ's ATR-20 antenna tuner handles a full 1.2 kW SSB and 600W CW with load impedances from 25–800 ohms. Features include an accurate built-in 3 kW true peak or average detecting directional power meter. Peak and average forward power, reflected power, and SWR are displayed on an illuminated cross-needle meter. MSRP = \$459.

For further information on these or other MFJ products, contact MFJ Enterprises, Inc., PO Box 494, Mississippi State MS 39762; tel. 1 (800) 647-1800; fax (662) 323-6551; E-mail [mfj@mfjenterprises.com]; site [http://www.nfjenterprises.com].



BC DXina

A neat little 90-page book, Discover DXing! (by John Zondlo, second edition), arrived from Universal Radio. This has to do with listening for distant AM, FM, and TV stations, not pileups on 20m. With the strange propagation conditions associated with our sunspot maximum, you may have been having some fun listening to skipping in FM and TV signals.

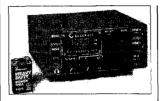
The book lists the AM band clear channel allocations, and lists the stations. It also lists the TV stations on channels 2–13, where the skip is most likely. I know that Boston's channel 2 has recently been wiped out for me by a skipping station.

In my search for stations carrying the Coast-to-Coast AM program, I've found the book's list very handy.

If you have any kids, you might get them interested in BC station DXing.

The book shows pictures and discusses the most popular radios, discusses QSLing, how skip works, and so on.

It is \$5.95, plus \$2 s/h, from Universal Radio, 6830 Americana Parkway, Reynoldsburg OH 43068; tel. 1 (800) 431-3939; E-mail [dx@universal-radio.com]. — W2NSD/1.



Elecraft K1 QRP Transceiver

As small as its original K2 predecessor, the new K1 runs up to 5W into two user-selected bands. LCD frequency readout displays output power, signal strength, supply voltage, keyer speed, and other information. Additional operating

features include push-button band selection, RIT and XIT, 8-50 wpm internal keying with message memory and autorepeat, and three crystal filter bandwidths. This kit can be ordered with any two of the following bands: 40, 30, 20, 15. MSRP = \$269; optional noise blanker. \$29; tilt-stand, \$35.

For further information about Elecraft products, contact them at PO Box 69, Aptos CA 95001-0069; tel. (831) 662-8345; E-mail [eric@elecraft.com]; site [www.elecraft.com].



Atomix Clox

Atomix atomic clocks from Chaney Instrument Co. keep precise time guaranteed to a fraction of a second, and they never need to be reset. Just set it and forget it. The clocks automatically reset themselves to the correct time, whether it's daylight savings or standard.

All Atomix clocks feature a special device that receives updates five times a day, via radio, from the official US Atomic Clock at the NIS in Boulder CO. There is also a deactivation device for states without daylight savings time.

Available at Wal-Mart or via selected mail-order catalogs, or contact Chaney Instrument Co. in Lake Geneva WI at 1 (800) 777-0565.

Original Swedish Keys

Morse Express has announced the availability of the original "Swedish Pump Key," in two versions, from Lennart Pettersson in Hoverberg, Sweden. According to owner Marshall Emm N1FN, the Swedish is one of the classic telegraph keys and is featured in all of the standard reference works.

"We were delighted to discover that it is still in production, and astounded to learn that there is a miniature version that is virtually unknown," Emm said.

Photos and more info on the Original Swedish (\$189.95) and the Miniature Swedish (\$249.95) are available at [www. MorseX.com], where you will also find secure ordering facilities. Or, contact Morse Express at 2460 S. Moline Way, Aurora CO 80014-3155; tel. 1 (800) 238-8205 or (303) 752-3382.

Say You Saw it In 73!

Hamsats Portable-Style

Somewhere between the world of chasing amateur satellites from a street corner or the deck of a ship with a handie-talkie, and doing the same from home with a big rig and steerable multi-element beam antennas, exists the temporary but stationary terrestrial hamsat station.

This is the station that can be packed in a suitcase for a trip to a vacation cabin or a serious campout. It might also be appropriate for an apartment dweller or someone with a small attic (very little antenna space), and prohibitive deed restrictions that won't allow any outside antennas.

Rig choices

Picking a rig for stationary-portable work may be as easy as grabbing the main base rig and packing it up. The Yaesu FT-847 is a classic example of a do-everything HF/VHF/UHF all-mode transceiver that covers most bands from 160 meters to 70cm. It runs on 12 VDC, and thus it's great for battery operation or, with an additional power supply, works well from AC house power. It's just a bit too large to use as a mobile rig, but it's small enough to fit in a large briefcase, with room for accessories. This radio, and perhaps the new Kenwood satellite-

ready transceiver, also does well in apartments and motor homes.

Check out the FT-847 specifications at [http://www.yaesu.com/ft847.html]. The features offered provide a good benchmark for comparisons and tradeoffs. While the FT-847 does not cover 1.2 GHz, or have a built-in TNC (Terminal Node Controller) for digital communications, it has plenty of power, a sensitive front end (built-in preamp), and the necessary jacks to interface with external 1200 and 9600 baud TNCs.

If your home hamsat station is large and composed of multiple rigs, transverters, amplifiers, preamps, and other external boxes that are required to make contacts, then it's time to start shopping. If new radios are not in the budget, make plans based on modes that you can pursue with existing equipment. If you are new to satellite work, get a copy of *Working the Easy Sats* by Gary

B. Rogers WA4YMZ, from AMSAT (The Radio Amateur Satellite Corporation). The latest revision is dated April 2000, has 33 pages, and provides a solid introduction to the amateur satellite program, with excellent hints on how to work the more easily accessed hamsats. You can reach AMSAT on the Web at [http://www.amsat.org], or via phone at (301) 589-6062.

Antennas

When you have chosen a radio for your compact station, it's time to consider antennas. For the cruise-ship HT effort, a long whip or a dual-band, hand-held yagi does well when chasing the single-channel FM satellites like AO-27 (AMRAD-OSCAR-27) or UO-14 (UoSAT-OSCAR-14), but these antennas are not convenient for a more stationary operation. It would be nice to have directional antennas with a complete az-el (azimuth and elevation) rotator system, but it is usually not convenient to carry this much equipment. Rotors, control cables, and boxes take up a lot of space, and finding a place for the rotatable antennas may be a problem, but this might worth considering.

A small dual-band beam, like the Arrow II from Arrow Antenna (http://members. aol.com/arrow146/index.html) of Cheyenne WY, will outperform just about any omnidirectional two-meter or 70cm antenna for portable satellite work. If you can rig a compact rotator system for this usually handheld antenna, it's a great performer. Most hams that have the Arrow II use it with a dual- band HT, but when used with separate radios for two meters and 70cm, the optional duplexer is not needed or preferred since it is limited to 10 watts on transmit. While Arrow has mounting hardware for rear-mounted stationary use, reworking the antenna for mounting at the balance point

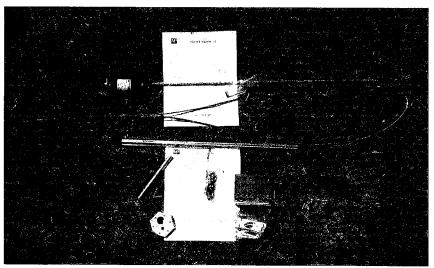


Photo A. The M-Squared EB-144 "Eggbeater" antenna with optional RK-2M radial kit and instruction sheets.

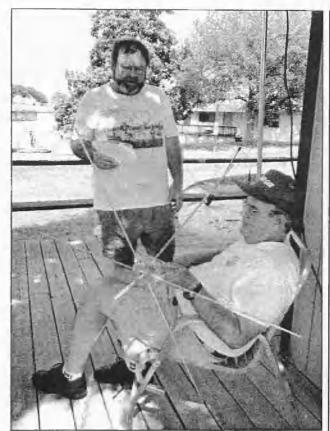


Photo B. John WASWOD and Charlie K5ENG easily put together the two-meter "Eggbeater" while on a fishing trip.

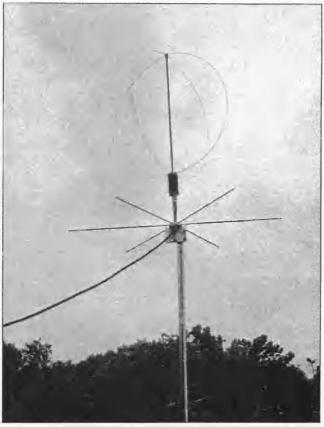


Photo C. The M-Squared EB-144 with radial kit on a pole and ready to go for some fishing-trip satellite contacts.

of the boom may be difficult, but would yield a very small turning radius for smallattic mounting. A whip antenna or ground plane is easy to pack and install, but the real advantage of these antennas is their ability to be oriented for best transmit and receive signals during a satellite pass. When used as a stationary antenna, the deep fades encountered make contacts difficult. This antenna is best left for the HT.

The true omnidirectional stationary antenna can provide a reasonable compromise between HT whip antennas and small beams. A good example is the "eggbeater" from M-Squared Antennas [http://www. m2inc.com]. They have a two-meter version (EB-144) and a 70cm version (EB-432). Both antennas exhibit horizontal polarization on the horizon, but overhead they have right-hand circular polarization. When used with the optional radial kits (RK-2M for two meters and RK-70CM for 70cm), the pattern is more hemispherical, with a circular lobe gain increase of 6 dB. The radial kit is designed for satellite work.

Both antennas will fit in limited spaces and can be used for almost any hamsat in the sky. They are not, however, designed to

be repeatedly assembled and disassembled. They are best used for the occasional trip or move. The loop elements are made from copperweld — copper over steel — and are rather stiff, but can be easily replaced if necessary. The 70cm version with radial kit retails for \$166, and the two-meter version with radial kit is \$177. The high prices are offset by the extremely durable components and quality construction, but can inspire antenna experimenters to build their own.

Due to the weak-signal nature of working AO-10 (AMSAT-OSCAR-10) with its high elliptical orbit, the best results with "eggbeaters" are found when the satellite is at or near its perigee, or orbital low point, when signals are strongest.

For 10-meter reception via RS-13, a simple dipole or inverted V antennas will do well, since most hams who pursue mode "A" (two meters up and 10 meters down) or mode "K" (15 meters up and 10 meters down) via the Russian RS-13 satellite use dipoles at home. A wire antenna is also very easy to pack and transport. For apartment dwellers, it can also be hidden by using fine wire and small diameter coaxial feedline.

Try it today

Small antennas may become the norm for contacts via Phase 3-D. But Phase 3-D won't be available for use immediately after launch. It may be several months before the transponders are available for general use. Start preparing now by trying new antennas and radio configurations via the current batch of low-Earth-orbit amateur satellites. You'll be glad you did!



Michael Bryce WB8VGE SunLight Energy Systems 955 Manchester Ave. SW North Lawrence OH 44666 [prosolar@sssnet.com]

HW-8 Notes + QRP PSU

OHMAGOSH! October already! Yup, and before you know it, Year 2000 will be in the history books. 2000 has been a so-so year for me. I've spent most of my free time working on Heathkits, especially the HW-8 transceiver. I've picked up a few pointers and some other interesting stuff for you to use on your HW-8.

A few months ago, we talked about the HW-8 QRP transceiver. I've come upon some information about the final output transistor that you may find interesting.

Replacement PA transistors

Heathkit used a house-numbered part. But from the printing on the device, it looks like Motorola made the transistor. I can't find a cross-reference for the Heath number anywhere. However, the instruction manual for the HW-8 references the part to a 2N4427. Mouser Electronics stocks this transistor. It's about \$3 a pop. You can use an NTE replacement, but the NTE part is much more money.

In my "HW-8 Handbook," a high power modification for the HW-8 is as simple as subbing in an ECG488 for the final. I found the ECG replacement guide on the Internet. They list the ECG488, but it's not the high power device I wanted. However, an NTE replacement part crosses the ECG488 to a NTE488. I have not yet tried this in my HW-8s. I did notice that NTE crosses the 2N4427 to a 15 watt RF device in a TO-5 case. The

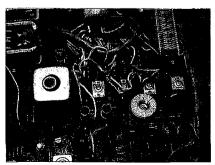


Photo A. Inside the HW-8. The final transistor is wearing the large heat sink. The transmit trimmers are in the background.

NTE488 comes in at a 5 watt RF device in a TO-5 case. I don't know why the difference between the two. I guess I will have to experiment with some in one of my radios.

I have had luck with the 2N3553 and the 2SC799. Both will produce a good watt and a half on 80 and 40 meters. On 20 and 15, the max power seems to be about one watt.

Don't use a 2N3866 unless you just have to. This device loves to operate up into the 450 MHz band. It will do so all by itself without any help from you. Usually, the 2N3866 is short-lived in an HW-8. The transistor will take off and go into thermal runaway.

In some of the HW-8s I have come across, I have put in MSPA20 in Q8 and Q5 locations. They seem to have a bit more bite than the original Heath- kit devices. Although I have not tried them, a metal case 2N2222A might work also as Q5 and Q8.

There are two other locations you should look at if you are having trouble with the HW-8's output. Check the zener diode at location ZD2. If this diode has become leaky, it may be the cause of low output. This diode is there to protect the final, Q9, from excessive high collector RF voltages. This happens if you key the transmitter into an open antenna. Any RF voltage over 36 volts will be clamped to ground via the zener diode.

If your HW-8 has been repaired in the past, especially with final PA troubles, look to see if a ferrite bead is on the base lead of Q9. This bead is there to keep Q9 stable. If your transmitter seems to take on a life of its own, check for this bead on Q9's base.

Improved trimmer adjustment

On 20 and 15 meters, you'll often find that the trimmer capacitors in the tank circuit

require tightening all the way down. There's not enough capacitance from the trimmer to get the stage to resonate. Take a 10 or 20 pF capacitor and tack solder it across the trimmer that is giving you trouble. Then try the adjustment one more time. With the extra capacitance across the trimmer, you should now find the circuit peaks without twisting the screw out of the trimmer threads. By the way, this fix works for the front-end trimmers as well.

Main dial fixes

Since the HW-8 is almost 25 years old, the vernier drive for the main tuning may have dried out. If it has, then you risk twisting the VFO capacitor apart if you tune into either end stop. Fixing the VFO capacitor is harder than a bag full of jawbreakers! The best fix is to not rip out the VFO plates in the first place. To keep this from happening, you should remove the vernier drive and relube it. The drive comes apart, but you first have to remove it from the HW-8's chassis. Once its out and in your hands, you can see how it unscrews. There's a set of ball bearings inside, so watch out you don't lose them when the two ends are removed.

Use some solvent to remove the old grease and other gunk that lives inside the drive. Then repack the drive with some bicycle grease. This stuff won't ooze out and won't dry out either. Cheap, too! Once you have reassembled the drive, install it back into the HW-8. You'll be rewarded with a smooth-turning VFO again.

A QRP power supply for a QRP transceiver

I've shown this circuit before, but still get requests for a small, simple power supply to operate QRP transceivers from. It's a classic!

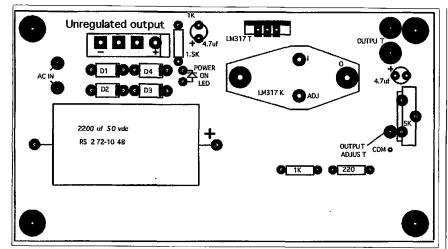


Fig. 1. PC board component layout. Bridge rectifier is RS 276-1146. D1-D4 = 3 A 50 PIV 1N5400, RS 276-1141. PC-mount trimmers are 5k, RS 271-217. D5, D6 = 1N914s.

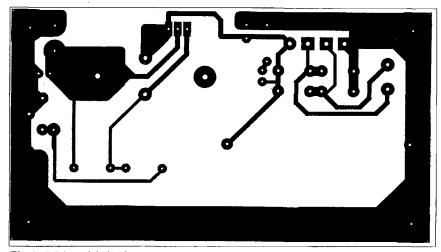


Fig. 2. PC board foil side.

The entire circuit revolves around an LM317 adjustable regulator. In the TO-3 case, the device will handle up to 1.5 amps. That's more than enough power for even the most QRO QRP rigs.

I used a junk box transformer, and just

about any thing in your junk box will work. However, don't use a transformer with a secondary higher than 18 volts unloaded. The regulator must drop any excess voltage and will run much hotter than needed. A 24-volt secondary into the bridge rectifier

will produce almost 29 volts to the regulator.

A six amp bride rectifier converts the AC from the transformer to DC, while the two 4700 μ F capacitors smooth out the ripple. The input to the LM317 is bypassed with two small 0.47 μ F capacitors. The output is also bypassed with a 0.47 and a 2.2 μ F capacitor.

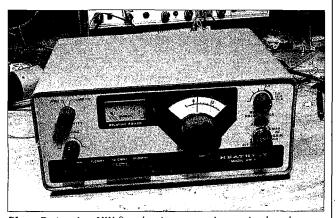


Photo B. Another HW-8 makes its way to the service bench.

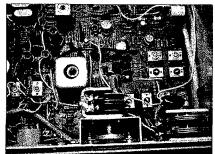


Photo C. The main VFO capacitor is just behind the VFO coil. The trimmers to the right of the VFO are for the receiver front end.

Since the LM317 is adjustable, we may as well place this control on the front panel of our supply. If not, then a small trimmer can be used.

There's a chance you might want to use this little guy as a constant voltage battery charger. If you do, then I've added a small three-amp silicon diode in the output lead. This diode will prevent the battery from discharging into the regulator if the main power has been turned off.

An LED for a "power on" indicator is thrown in just to let you know that the power supply is in fact on.

Building the QRP supply

This is such a simple project, point-topoint construction would work just fine. The use of terminal strips and tie strip would be all you need. Use a small aluminum chassis to hold everything. The LM317 needs to be heat-sinked, so use the aluminum chassis and a TO-3 insulator kit to mount the LM317.

Use your digital VOM and set the output voltage with the trimmer or panel-mounted pot. Add some five-way binding posts and you're done!

Next month, I'll look at the Heathkit HW-9 QRP rig. It's been a while since we took a look inside this guy.



Simon Lewis GM4PLM Creoch Farm Ochiltree Ayrshire KA18 2QH United Kingdom

Microwave P3D

Here's all you need to know.

Microwaving is a very interesting area of our varied hobby, and one on which I have centered my attention for a number of years. There are numerous reasons for this interest. Microwaves are still not fully understood, and many of the propagation modes are still being investigated, especially as the commercial world is not interested in the "anomalous" propagation events that we get excited about.

icrowaves are also an area where home-brewing is the norm, and, certainly for the higher microwave bands, a must, as the big three do not produce equipment for any band above 1.2 GHz. This leads microwaving to be an area for experimentation, and one in which home-

brewing your own equipment is still the norm. I was therefore very pleased to hear that Phase 3-D would carry a range of microwave transponders, a move I think will revolutionize the world of satellite amateur radio.

So what are "microwaves," and why the big interest for Phase 3-D?

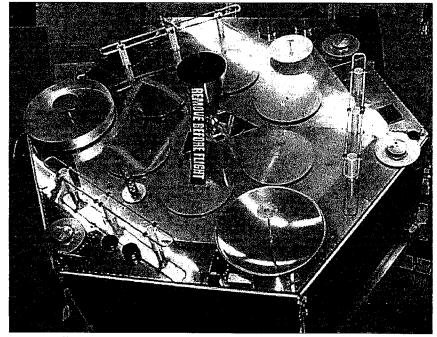


Photo A. P3D microwave antenna array.54 73 Amateur Radio Today • October 2000

Well, in amateur terms, microwaves refer to any band above 1 GHz, so any band from 1.2 GHz and up can be referred to as a "microwave" band. As for Phase 3-D, this new satellite is a revolution for the amateur world. For the first time, an amateur satellite is carrying a full range of new and exciting transponders, allowing global amateur communications using small, compact, low power ground stations.

For the old-time satellite hams reading this, a word of warning! I am going to be controversial. No, I mean "really" controversial, because I predict that once Phase 3-D flies, modes using VHF/UHF uplinks and downlinks are dead and buried. Read on and I'll explain, but mark my words, mode B is dead! Long live mode L/S! Remember where you heard it first!

Phase 3-D is a big satellite. The other articles in this issue will cover a variety of topics about P3D, so I will concentrate only on the microwave aspects of Phase 3-D and leave the other specialists to their areas.

The P3D satellite carries a range of microwave transponders almost covering the entire amateur microwave spectrum. The lowest band covered is the 23cm band (1296 MHz), and the

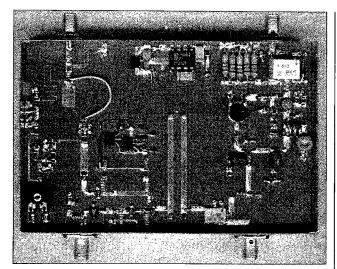


Photo B. Single board microwave transverter.

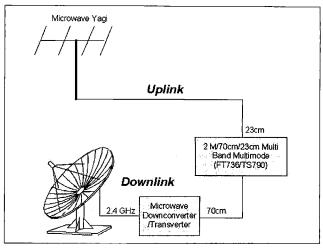


Fig. 1. Phase 3D microwave ground station using 2 x 2 meter multimodes (mode L/S).

highest, the 24 GHz band. A full list of microwave transponders is shown in Table 1 of the article "With Fingers Crossed" elsewhere in this issue.

The P3D transponders operate on a matrix, allowing any one transponder to "talk" to another. This allows an unlimited combination of transponders to be operated by the ground control stations. Each transponder also has a set of beacons that will transmit a variety of information. These beacons will primarily transmit 400 bps PSK, a mode already used on previous AMSAT missions, and one for which a vast number of ground stations are already equipped.

More importantly, these beacons will also transmit at a known power level. That is a vital piece of information, because knowing that the beacon transmits a set power level, you can make improvements to your station, or carry out measurements, and have the ability to measure these changes using the beacon as a known standard. The satellite will carry standard analog transponders that will allow SSB/CW signals to be transponded, but there are also a variety of digital experiments being flown, including digital cameras, a flying mailbox system, and high speed digital modulation experiments. The microwave bands make these experiments particularly interesting. The up/downlinks will be strong, and the bandwidth of each transponder is wide enough to carry some interesting signals and some unusual experiments.

The satellite is bristling with antennas for the microwave bands, and these will allow P3D to produce excellent signals on the ground as they have compact beamwidths and high gains. **Photo A** shows the impressive array of microwave antennas onboard the satellite. It is relatively easy to calculate the power required versus antenna gain by using a small spreadsheet program. One such spreadsheet has already been produced for Microsoft Excel and is available on the AMSAT Web site. It shows that very small amounts of power will be required to very modest antennas (small dish of 60cm or small yagi).

So why are microwaves so important to the future of amateur satellites?

For a long time now, VHF/UHF have become very noisy, in some places almost unusable. Users of the FM repeaters on the UOSATs will tell you that in some parts of the world they are unworkable due to the variety of ground-based services that illegally (and sometimes legally) use the VHF and UHF satellite subbands.

In 1992, James Miller G3RUH said that mode S would become the preferred downlink for Phase 3 satellites, and I would support that theory wholeheartedly. Here are some reasons why, and before you diehard mode B operators jump off the deep end, think about the points carefully and consider their technical merits:

• 145 MHz is noisy. This comes

from a variety of sources: electrical, the weather, the sun, sky, other users, computers, SATTV, and the list is almost endless. And it's getting worse! Is this the right band for downlinks?

 Antenna sizes for 2 meters are big - with planning development problems becoming common and gardens



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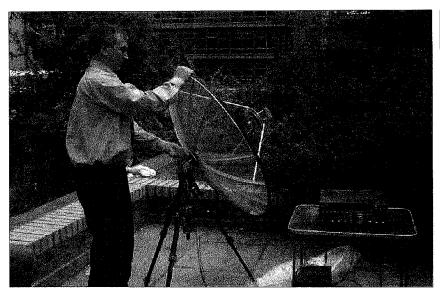


Photo C. Freddy ON6UG, working 2.4 GHz.

becoming smaller (in Europe anyway!), antenna size has become a major factor in people's operations. Which would be easier to install, a 10-or 11-el yagi for 2 meters or a 60cm SATTV dish?

• Technically, VHF is a poor choice. The typical noise at VHF measures approximately 1200k. At 1.2 GHz, this is typically 120k, a factor of 10 times quieter. This means that for a given radiated power the ground station antenna could be 10 times smaller. Given that a 60cm dish could have 25 dB

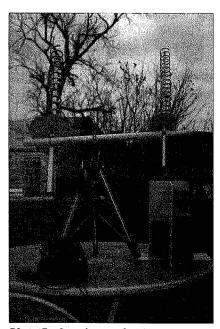


Photo D. Complete mode L/S station.56 73 Amateur Radio Today • October 2000

gain at 2.4 GHz, and a typical 10 element yagi approximately 10 dB gain, that size decreases even further.

• Give smaller antenna sizes that also relate to cost and station equipment. No more large antenna arrays, less mechanical engineering, less windage, less maintenance, less neighborhood impact. It goes on and on!

Recent demonstrations at the AMSAT-UK Colloquium on UO-36 showed how suitable 2.4 GHz is for satellite downlinks. A quote from Peter Gülzow DB2OS summed this up suitably: "Freddy's (ON6UG) S-band downlink demo was a real eye-opener for all. It gave a pretty good idea of what we can expect to see on P3D, and Freddy said that the dish antenna he demonstrated (60cm parabolic) was already overkill. Many people understood why P3D will be the Easy-Sat."

And that demonstration was with a whopping I watt down from UO-36 with the antenna off-pointing by several degrees! Since 1992 technology at microwave frequencies has marched on, and access to microwave frequencies is easier now, than it ever has been. So what technical reason is there for not using them for satellite down/uplinks?

Antennas

What kind of equipment will be needed for P3D microwaving? Well, let's look at antennas first. Starting on

the lowest band at 23cm, a small helical yagi will be required. These are available cheaply commercially, or even cheaper if home-brewed.

The ARRL Handbook contains the design details for a suitable antenna. For the higher bands, small parabolic dishes will be the norm, although for 2.3 and 3.4 GHz small helical yagis are still perfectly feasible. The dishes do not need to be anything special. Down East Microwave sells a range of 500mm and 600mm dishes that will be perfect for the job. Dish feeds are easy to make and will either be small horn feeds using food tins, or helical feeds using a few turns of copper wire mounted on an N-type connector at the focal point of the dish.

The beauty of such small dishes is that the beamwidth of the dish will still be quite wide (510 degrees), and it will be much easier to point at P3D. "More expense," I hear you groan! Not really! There is a plethora of ex-SATTV parts available at flea markets. An SATTV positioner screw jack will be perfect to use as an elevator, and even better if you still have the original control unit!

Feeding the dishes and yagis is worthy of note. Microwave power is expensive to generate, and you don't want to lose that power in poor cables and connectors. Use only the correctly rated connectors (N types and SMAs at anywhere above 1 GHz), and interconnecting cables and feeders should be the best possible rigid foam coax you can get your hands on.

Here is another advantage of using microwaves. The dishes and positioners do not need to be mounted high, as long as they have a clear view of the sky. Mounted on the apex of a roof or on a small tripod on a garage or conservatory flat roof will be fine. The closer to the shack the better, keeping feeder lengths as short as possible. In my station, the tripod is mounted on the lawn outside the shack window — a distance of only 12 feet!

RF equipment for P3D is readily obtainable, and many people have a 2 meter multimode in the shack already. This is an excellent starting point, as most microwave transverter designs use 2m as the driving band. High

power is not necessary for the transverter; most require just a couple of watts in, 23cm modules are available for older radios such as the Kenwood TS-790 and Yaesu FT-736R. More modern radios such as the Icom IC-821 and Yaesu FT-847 are also suitable, having the built-in satellite functions required for P3D. Of course, two separate 2 meter multimodes driving individual transverters is perfectly acceptable, and there are a number of ready-built 23cm designs available from commercial sources. SSB Electronics, Down East Microwave, and DB6NT all produce suitable equipment.

It's easier than you think

Life gets a little more complicated on the higher bands, and we have to overcome what is known as "Microphobia" - an irrational fear of constructing anything for the microwave bands! Outlining how amateur microwave equipment is constructed could be the subject of a completely separate article! But it really is quite simple, and the rule of thumb is that if you can follow a set of basic construction rules, place components exactly onto a PCB as the designer originally intended and as shown in the documentation, and learn to solder surface mount components using a small soldering iron, then you really can construct microwave equipment.

I managed to construct a working 10 GHz transverter that worked first time, having never constructed a piece of microwave equipment before. I can do it, many others have done the same, and you can do it, too - honest! It's quite simple, and not rocket science (excuse the pun!), and within every amateur's capability. Modern microwave units are quite simple and usually contain very low component counts. A typical single board 23cm unit designed by Charlie Suckling G3WDG, and available as a kit from the Microwave Components Service of the Radio Society of Great Britain. is shown in Photo B.

A variety of kits and modules for the higher bands are available from a multitude of sources, and many of these kits are easily constructed by following the basic microwave construction rules. Many of these kits have been in the planning stages for some time, awaiting the day that Phase 3-D flies.

So how does a station fit together? Fig. 1 shows the basic block diagrams of simple stations for use on Phase 3-D. Most of the stations simply require either a multiband, multimode, such as an FT-847/FT-736/TS-790 and transverters, or rely on two dedicated 2 meter multimodes and dedicated transverters for uplinks/downlinks. The transponder matrix in Table 1 of "With Fingers Crossed" indicates that any uplink could be connected to any downlink, so it is easy to come up with a few basic building blocks that can be



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mixed and matched to provide capability for a variety of transponder modes.

Operating P3D will be a joy using microwaves. Signals will be very loud and crystal clear with little noise received from other sources. The microwave hands are relatively quiet at these high frequencies, and P3D downlinks will not suffer from the terrestrial interference that mode B or J suffers from ground-based sources. As antennas beamwidths are relatively narrow compared to VHF/UHF vagis, stations using just a few watts will be the norm. A multitransponder ground station will be neat, compact and very efficient. For those of you living with small suburban gardens, this is your passport to paradise. The ability to work stations worldwide with just a small dish antenna and miniature yagis on the lawn or garage roof will be very pleasing, and will open the door to many amateurs who may previously have been limited in their operations.

I predict that there will be a surge of satellite activity as many amateurs take advantage of these features and the ability to operate long-range communications from such compact antenna systems. Have I convinced you yet that mode B/J is dead?

The microwave bands will also be beneficial when using the high speed data projects such as RUDAK (flying digital mailbox) and SCOPE (digital camera project). With noise-free downlinks and wide bandwidths able to support reliable high speed datacoms, these downlinks will become essential to reliable high speed digital communications and will support these projects perfectly. It is almost certain that the microwave downlinks will be essential to make the most of these projects.

So how do I get started, I hear you ask? Well, you started already by reading this article.

The next stage is to assess what equipment you already have available to spare, and to decide whether this equipment is to be permanently allocated to satellite communications. Once you have decided what bands to use and what equipment you already have to spare, you can then make a judgment on what equipment you will need to buy and/construct.

One word of advice, however! Don't be afraid to look at commercial satellite TV equipment for use within your station. Satellite positioners and surplus dishes are all suitable, in fact highly desirable, if you can obtain them, and they will save hundreds of dollars over new, dedicated amateur items that will do the same job. Horn feeds and vagis are easily constructed using simple hand tools, if you do not wish to buy new. Where you should spend money is in feeder or RF equipment. Money spent here will be wellfounded and provide an excellent basis on which to work.

Phase 3-D's microwave transponders will offer an excellent way of becoming involved in amateur microwaves, and the UK is already seeing an upsurge in activity as people gear up for Phase 3-D. This new satellite offers amateurs the perfect opportunity to become involved in one of the most interesting aspects of amateur radio, one that will surely change the face of amateur satellite operations from the moment of launch. Hopefully, sometime later this year you should get the opportunity to become part of that history. Be brave, and listen to the technical reasons for using microwaves. The future is here, and it is a bright one in the microwave spectrum.

Godspeed, Phase 3-D, and here's wishing the P3D crew all the best for a successful launch campaign. See you in history, 73 de Simon GM4PLM.

With Fingers Crossed continued from page 16

Note

1. Radio Communication Handbook, 7th edition, published by the RSGB, UK.

Cruising for Satellites continued from page 26

(AO- 37?) using a "big" rig, the Yaesu FT-847 [http://www.yaesu.com/ft847. html]. The antenna will be an Arrow II on a tripod. The MV CPR is appropri-

ately named, as it has been refloated after sinking twice in 1997.

Are you ready?

WB5RMA [http://www.heathermacallister. com] and I are already thinking about taking a cruise in Alaska waters next year. We've seen great video tape from AMSAT Awards Manager Mike Scarcella WA5TWT and his XYL Rae, from their Alaska cruise. We've heard the story of Lee KØLEE's "inside passage" grid expedition. Why not?

There are a lot of radios and antennas out there that I would like to try, but only, of course, during those free times out on the water when the floating casinos and bars seem dim compared to the bright or starlit skies from the upper decks. Check out [http://www.amsat.org] for more information about the hamsats and how to use them.

OSCAR-10 Antenna System continued from page 37

Simple answer — use the best you can afford. This is more of an issue if your feedline run is long. The shorter your feedline, the better, I am using 9913 between the station and the preamps, and Bury-Flex from The Wireman between the preamps and the antennas. Make sure the feedline you are using is capable of the twisting and flexing that is required to go around the rotators. Also pay particular attention to make sure that the feedlines will not bind or get caught on anything, while both rotators are moved throughout their entire range of movement. Whenever any change in the feedline routing around the rotators is made, make sure that the cables won't bind on anything. I always stand on the roof and watch while someone in the shack moves the rotators throughout their ranges of rotation. Because my antennas are very close to the roof of my house, I can't have the feedlines hang off the back end of the antennas (as is often recommended), to prevent having the feedline disrupting the antenna pattern.

Continued on page 59

OSCAR-10 Antenna System continued from page 58

The future

Later this year, I plan to install a heavy-duty 40-foot tower. When the tower gets installed, the satellite antennas will be moved to the tower, and the preamps may be moved to the antenna feedpoints. Although I don't need the higher elevation by moving the antennas to the tower, I am doing it because I use the satellite antennas for some terrestrial SSB operating, and, maybe more importantly, in order to get my wife to agree to the tower, I will be replacing the existing mast with the tower, not "adding" the tower. Got to keep my nonham wife happy!

CALENDAR EVENTS

continued from page 42

on-site, beginning at 8 a.m., by CAVEC. Bring original and a copy of your current license. picture ID, and \$3 fee.

NOV 12

CHICAGO, IL The DeVry Institute of Technology, 3300 N. Campbell Ave., Chicago IL, is the location for the Chicago ARC Ham Auction, Sunday Nov. 12th. Items in auction will be transmitters, receivers, transceivers, amplifiers, tuners, accessories, signal generators, oscilloscopes, 2-way radios, TVs, VCRs. antique radios, tubes, parts, books, computers, audio, stero, etc. Your electronic goods will be auctioned if you bring them in before noon. All sold goods are subject to a 10% donation. If purchased back by the seller, then a 5% donation will be due. All items sold on an as-is as-shown basis. All sales final. For more info. call Dean, (708) 331-7764, morning or evening; call George, (773) 545-3622, 10 a.m.-1:30 p.m. or after 3 p.m. Remember, one man's junk is another man's gold!

NOV 18, 19

FT. WAYNE, IN The 28th Annual Fort Wayne Hamfest & Computer Expo, sponsored by the Allen County Amateur Radio Technical Society (AC-ARTS), will be held at the Allen County War Memorial Coliseum at the corner of Indiana 930 (Coliseum Blvd.) and Parnell Ave. Open to the public 9 a.m.-4 p.m. EST on Saturday, and 9 a.m.-3 p.m. EST on Sunday. Vendor setup is Friday evening and Saturday morning. Admission \$5, good for both days, at the door only. Parking is \$2. There are over 1100 commercial and flea market tables all

under one roof, containing both new and used radio, computer, and general electronics items. Activities will include many forums and meetings, with VE exams on Saturday. Shuttle bus service provided to and from Smith Field Airport, and shopping centers. Talk-in on 146.88(-). For more info, leave a message on the answering machine at (219) 483-8163 (tables), or (219) 484-1314 (general info), and vou will be contacted. You can also send an SASE to AC-ARTS / Fort Wayne Hamfest, P.O. Box 10342, Fort Wayne IN 46851; or visit the WWW site at [http://www.acarts.com].

SPECIAL EVENTS, ETC.

OCT 9-15

ATLANTIC CITY, NJ The Southern Counties ARA will operate K2BR from Oct. 9th at 1400 UTC to Oct. 15th at 0400 UTC, from the Miss America Pageant in Atlantic City NJ. Atlantic City is located on Absecon Island, which is IOTA NA111. Suggested frequencies for 10, 15, 20 and 40 meters: Phone - 28.325, 21.325, 14.250, and 7.250. CW - 28.030, 21.050, 14.050 and 7.050. QSL with a #10 SASE to SCARA, P.O. Box 121, Linwood NJ 08221 USA.

OCT 28, 29

MOROCCO The Bavarian Contest Club will be operating again as CN8WW from Morocco, in the CQ WW Contests. They will be a Multi/ Multi team, so there is a very good chance to work CN on all bands from 160-10m. There will be a new picture QSL card for the upcoming activities. Work CN8WW on 5 or 6 bands and receive a special QSL card to honor your high performance, CQ WW Contest SSB: QRG's (± QRM): 1.840 / 3.799 / 7.099 / 14.255 / 21.355 / 28.455 kHz. Before and after the contest the station will operate as 5C8M in CW, SSB, RTTY, on 6 meters, and also on the WARC bands. Check the homepage [http:// www.dl6fbl.de/cn8ww/] for information about the DXpedition, QSL cards for CN8WW and 5C8M go via DL6FBL (buro or direct): Bernd Och, christian-Wirth-Str. 18, D-36043 Fulda, Germany.

OCT 31

BREVARD, NC For the 12th consecutive year, the Transylvania County ARC will operate a Special Event station from Transylvania County NC on Halloween. The callsign will be K4HXZ. Hours of operation will be from 1800Z-2359Z on Oct. 31st. Frequencies will be 7.195, 14.295, 21.365, and 28.335 SSB; also 146.55 FM simplex. For certificates, send a business size or 9 x 12 SASE to T.C.A.R.C., P.O. Box 643. Brevard NC 28712 USA. Weather permitting, operation will be from The Devil's Courthouse, on the Blue Ridge Parkway.

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Stability — or Blackout?

Worldwide conditions should improve steadily as the HF-friendly winter months approach, but with sunspot Cycle 23 nearing its peak, strong solar disturbances may occur more often ... witness the severe particle storm of July 14–16! The most likely ionospheric disruptions will occur near the middle and at the end of the month — the latter possibly causing a partial blackout lasting into the early days of November.

Europe

Middle

East India/

> Pakistar Far East

Japan Southeas 17-20

17 20

10-12 10-15 (10) 17 (15) 20

20

(17-20) 17-20 17-20

20-40 (20) 40 30-40

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17-20 17-20

x (17-20) (17-20

(20) x x

(15-17) (17-20) x x

10 (40)

Generally, moderate daytime ionospheric absorption at midpath local noon is expected, especially for paths across the Equator. Echo and fading associated with the aurora will often be present across the higher latitudes, but VHF CW operators might take advantage of short, late-night auroral-E openings of up to 1,200 miles.

On most days, however, the ionosphere should be quite stable, easily recovering from the smaller disturbances and providing excellent around-the-clock HF opportunities. Be sure to work the twilight "gray line" for some very long paths into South America, and also look for some unusual opportunities just before and after the (P)oor days marked on the calendar.

Band-by-Band Summary

10/12 meters

Good daytime paths will occur between the coasts and into Central and South America, but expect some noontime fading. Look for afternoon openings into the Pacific and Australasia, with an occasional path to Africa. A short-skip of 1,000–2,000 miles will be typical.

15/17 meters

Openings to most areas of the world should occur on (G)ood days, especially south of the Equator. Try Europe before noon, Africa and the Middle East after noon, and the Pacific or Asia in the late evening. Short-skip distances average about 1,000 miles.

October 2000						
SUN	MON	TUE	WED	THU	FRI	SAT
1 F-G	2 F-G	3 F-G	4 G	5 G	6 G	7 G
8 G	9 F-G	10 F	11 F-P	12 F	13 F	14 F
15 F	16 F-P	17 F-P	18 F-P	19 F	20 F-G	21 G
22 G	23 G	24 G	25 F-G	26 F-G	27 F-G	28 F-P
29 P	30 P	31 VP				

Table 1. Calendar.

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South America	15-20	(15) 20	20 (40)	(20-40)	(20)	×	(15)	10 (15)	(10)	(10-15)	10-15	15-20
Western Europe	(20) 40	30-40	(40)	(40)	х	x	(15)	15	(10) 17	15-20	(15) 20	20
Southern Africa	20 40	(20)	20-40	(20-40)	x	x	(15)	(10) 15	10 (15)	(10) 15	15-20	(17) 2
Eastern Europe	(20-40)	(20-40)	17-20	17-20	(20)	(20)	(15-20)	(10) 15	(15)	17 (20)	17-20	(17-20
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India/ Pakistan	(17-20)	×	×	x	x	x	×	(15-17)	×	×	×	×
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Southeast Asia	×	×	(17· 20)	×	×	(17-20)	(17-20)	(10-15)	×	×	×	(15)
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South America	15-20	17-30	17-30	20 (40)	(20)	(20)	×	(10-15)	(10)	(10)	10-15	10-1
Western Europe	(20)	(40)	(40)	×	x	x	(20)	(15-20)	15	12-17	(15) 20	20
Southern Africa	(20)	(20-40)	20	(20)	×	×	×	×	(10)	10-15	15 (20)	(15) 2
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Middle East	(20)	(40)	×	×	x.	×	×	(15)	15	×	(20)	20
India/ Pakistan	×	(15-20)	×	x	×	×	Х	(15-20)	x	X.	×	×
Far East/ Japan	(10-15)	(15-20)	(20)	(20)	×	x	(20)	(20)	×	×	×	(10-1
Southeast Asia	(10-15)	×	(20)	×	Χ.	×	x	×	(10-15)	(16)	x	×
Australia	10 (15)	12-17	(15-20)	(20)	20	20-40	20-40	(20)	x	×	(15)	10 (1
Alaska	15.20	(20-40)	(40)	(40)	×	10-20	10-20	10-30	10-30	10-20	10-20	10 (20
Hawaii	10-15	12-17	12-20	(15) 20	17-30	20-40	30 (40)	17-20	X	(10) 13	10-15	(10) 1
			v	VESTE	אט אא	VITED :	SIAIE	S (0:				
Central America	10-20	15-20	15 30	(14) 40	20-40	(30-40)	×	(15-20)	10 (20)	10 (20)	10 (20)	10 (2
South America Western	10 20	15-20	(15-20)	(15) 20	(17-30)	(17-30)	×	×	×	×	(10-12)	(10-12
vvestern	(17-20)	(17-20)	x	×	×	×.	×	*	(15-17)	(15-17)	15 (20)	17-2

Table 2. Worldwide HF band openings for October 2000. Notes: (1) Plain numerals indicate bands which should be workable on Fair to Good (F-G) and Good (G) days. (2) Numbers in parentheses indicate bands usually workable on Good (G) days only. (3) Dual numbers indicate that the intervening bands should also be usable. When one number appears in parentheses, that end of the range will probably be open on Good (G) days only. (4) Be sure to check adjacent bands and times (±2 hours) for additional openings.

x (20)

10-12 (12) 17 15-17

(15-20) (20) (20)

(20)

(10) 20 10-20 10 (20) 10 (20) (10) 20

×

(15-17)

×

15-20

×

x (15) (15-17) (17-20) (20)

x (15-17

(20) (17-20)

(20) 40 (20-40) (15-20)

(40) (20-40)

20 meters

As usual, most areas of the world are workable from just after sunrise until long after dark. Peaks are often right after sunrise, again in the late afternoon, and in the hour or so before midnight. Expect a 500-1,000 mile short-skip during the day and 1,500-2,000 miles at night.

34/40 meters

Don't overlook these bands for daytime short-skip up to 1,000 miles, but you'll do best at night into Central or South America and Australia, especially on (G)ood days. Operators east of the Mississippi might try working the Mediterranean after dark. Daytime short-skip is typically about 1,000 miles and 500-2,000 miles after dark.

80/160 meters

Worldwide DX can be observed from local sunset until local sunrise on (G)ood days, provided that atmospheric noise is low to moderate. Good activity on 40 meters is a clue that these bands might be open. Short-skip is usually from 1,000-2,000 miles.

73 and happy DXing!

ON THE GO

continued from page 43

So, as you're planning, after you have identified the agencies you will serve and where those agencies will need hams, take a good hard look at the physical constraints and determine how you can best equip these facilities to ensure optimal operation.

Do you have a map of the area showing the coverage of your key repeaters? Have you thought of equipping the locations at the fringe with higher-power radios? Maybe it's a good idea to save the HT-equipped operators for those locations closer in. If there is a shelter you will be manning, do you know where the communicator will be located? Has anyone tried this operating location before things get a little intense? If there is emergency power available, is the operating position located so that the emergency power can be accessed? Hospitals, for example, have redundant emergency power available, but not every electrical outlet will provide emergency power.

External antennas are the other area that must be investigated. If you have a good relationship with your supported agencies, getting external antennas mounted may not

be a totally insurmountable problem. There may be a few hurdles. Shelters are often located in local schools, and the school board may not be interested in people poking holes in their roofs. On the other hand, if the local Red Cross is requesting it, there may be a more positive response. If the county Emergency Management Office is interested in prepositioning antennas, the response might be downright enthusiastic. Something about the county and its ability to impact funding or something.

Don't forget the 6 Ps! Planning may not make a difficult situation easy, but it can make it doable. Learn from the mistakes you've faced in the past, and help others learn from yours. Share your ideas for keeping Murphy out of the equation when responding to a disaster. What problems have you encountered? How did you solve them? What lessons have you learned that you'd like to pass along? I'll be glad to hear from you. If you submit an interesting enough idea, I'll even see that it gets passed along so that other readers can benefit from your experience.

HOMING IN

continued from page 47

banquet and local airport transit in this price, but you might decide to offer these separately. Some participants may choose to stay with relatives or in another location, so an alternative price without lodging and meals (but including the box lunches on competition days) should be announced.

So that's what it takes to put on a multination ARDF event. It's not too hard. If your club members have ever put on a big hamfest or ARRL Convention, then they probably have all the needed experience and skills.

What better way to generate enthusiasm in your club, help your fellow hams, promote international goodwill, and have a great time doing it! As USA's IARU ARDF Coordinator, I'll try to help every step of the way. Contact me, and let's get started!

NEUER SAY DIE

continued from page 8

staffers were released to go out and find productive work.

Cold fusion development has been stymied by the oil-coal-gas-power company bloc making sure the research funding has been cut off. For under \$10 million in cold fusion development we might be able to leave some oil in the

ground for our grandchildren and greatgrandchildren, instead of stripping the planet of every drop of recoverable oil.

continued on page 62

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NEUER SAY DIE

continued from page 61

Forever. And never mind how this would clean up the air in our cities. Cough.

Bore is in hot water over lying about his fund-raising activities. Jeeze, someone in the White House lying? Tell me it isn't so, Joe. Well, you can read the gory details in the newsmagazine reports (see *Time*, July 3rd, p. 32), which nails Bore.

Mind you. I'm no fan of Gush. and I dislike many of the goals of the Republicans. Nor am I a fan of the tax and spend Democrats, and their constant love affair with socialism. I like many of the Libertarian ideas. The Reform Party has possibilities. if it can shake its connections with Perot and disentangle itself from the Buchanan bunch's efforts to steam-roller it.

Anyway, it's Bore and Gush. Bore fans should make every attempt to avoid reading the Nicholas Lemann 18-page piece in the July 31st issue of The New Yorker, a magazine not particularly known for its leanings to the right. Nick, who has traveled extensively with the vice president, endlessly skewers him with his own quotes, showing him to be a chameleon politician, with no detectable thoughts of his own. His "opinions" have been and are carefully crafted by focus groups to match the sentiment of the day. His speeches, prepared by his staff, are almost word-perfect duplicates of each other.

However, if you want to know more about this potential president, then please take the time to read the article. If you're not a subscriber, despite my past recommendations, then at least visit a library.

If an 18-page article is beyond your reading ability, then you can get the core concepts by reading the three-page article in the August issue of America's 1st Freedom. the NRA magazine. Bore used to be a poster boy for the NRA, receiving three "A" grades from the NRA Political Victory Fund — now he's championing gun licensing,

registration, and taxing. This piece nails Bore on his lies and exaggerations — on his war record, his having "found" Love Canal, creating the Internet, on his abortion stand, campaign finance reform, and so on. He's now antitobacco, yet he continued to farm tobacco and pep talk his fellow tobacco producers for four years after his sister's death from lung cancer.

Sowell Food

Though politically I'm a conservative, about the only columns I really enjoy in Conservative Chronicle are those by Thomas Sowell. He's worth the price of the subscription for me.

Frinstance, "With all the political hysteria whipped up this year about school shootings, more children are killed each year by bee stings — and far more killed by airbags mandated by the government."

And, "When my daughter recently asked me what the Department of Energy does, it was hard to answer. What she really meant was: What does it accomplish? The answer is practically nothing, except creating a nuisance with regulations and red tape."

Well, you get the idea.

Genome Piffle

Wow, bi-i-g deal, they've done a rough outline of human genes, a project, according to the press, on the level of our putting a man on the Moon. Well, you know what I think of that hoax, so ask me what I think of the value of the genome project.

Glad you asked. Piffle.

Yes, certain illnesses do tend to run in certain families, and I don't doubt that genetic differences will exacerbate the problems for people. And, yes, scientists may be able to repair these "defective" genes.

For that matter, parents screw up their children's genes by ingesting poisons such as alcohol, nicotine, caffeine, NutraSweet, and so on prior to conception, damaging the genes in their sperm and ova.

Plus further damage during pregnancy, and so it goes. We know that, just by doing the right things at the right time, it's possible to increase a child's IQ by 40 to 50 points over not knowing what to do when.

But curing most of our illnesses with gene therapy? Nonsense.

I'm convinced that miseries such as Alzheimer's, Parkinson's, cancer, heart trouble, and so on can be eliminated by treating our bodies better. I go into detail in my Secret Guide to Health. My mantra is simple: Stop poisoning your body, give it the food it has been designed over a thousand generations to use, plenty of pure water, lots of sun and exercise, and keep stress to a minimum.

We eat pop tarts. coffee, and Danish for breakfast, Whoppers with fries for lunch, and pizza for dinner, and then blame genes for the mess we've made of our body. Phooey.

More Anthrax

While watching a segment on 60 Minutes about a soldier being court-martialed and discharged for refusing to be inoculated with the anthrax vaccine, one thought never seems to have occurred to anyone involved. Of course the excuse given for making every member of the military get the anthrax vaccine was to protect them during the Gulf War.

But that was ten years ago! That excuse doesn't make sense anymore.

If the Long and Jones bioterrorism book is right, Iraq has over a hundred elevenperson cells in the U.S., all busy making and freeze-drying anthrax pathogens. Their plan is to suddenly spread this in our major cities, and use crop dusters over smaller towns, with the goal of killing 200 million Americans within a few days.

Now, if this is true, the government most certainly knows about it. But, since there's no way to inoculate 350 million Americans, they don't want to create a panic by letting the

word out — particularly since there's not much they can do to prevent it from happening — and worse, going public might trigger the attack.

To me, the spreading of an oral anthrax vaccine from the air, as a way to make it so we'd just get sick, but not die, makes sense. Further, since they have enough vaccine to inoculate the military, I can understand why they've made it mandatory. If 200 million Americans die, we'll have martial law in place immediately.

I listened to a lame excuse for the chem trails the other night. They're just high-flying con trails. Oh, baloney. I've seen the skies over southern New Hampshire crisscrossed with chem trails, spreading out and slowly falling to earth. At the same time I've seen some con trails at a higher level, and they were going the normal route from Europe to Boston and Chicago, which passes over my area, and fading away after a few minutes. And Art Bell interviewed a military pilot who said that his tanker plane had often been fully loaded by the CIA with some liquid when he took off. He then had to fly a weird flight plan, and when he landed his tanks were empty. Water crystals from con trails? Sure.

With there turning out to be so many things that our government has lied to us about, I don't have to be a conspiracy theory nut to be suspicious of it — particularly when the pieces of a puzzle seem to fit.

Trusting the FDA

It's approved by the FDA, so where's the problem? Here's a government outfit that charges food and drug companies an average of around \$250 million to okay a product for sale to the public — a charge that we protected users have to pay with a higher product price. So, how well protected are we?

Well, I've written several times about the dangers of using aspartame, best known by dieters as NutraSweet. The

Continued on page 64

Here are some of my books which can change your life (if you'll let 'em). If the idea of being healthy, wealthy and wise interests you, start reading. Yes, you can be all that, but only when you know the secrets which I've spent a lifetime uncover-

.....Wayne

The Bioelectrifier Handbook: This explains how to build or buy (\$155) a little electrical gadget that can help clean the blood of any virus, microbe, parasite, fungus or yeast. The process was discovered by scientists at the Albert Einstein College of Medicine. quickly patented, and hushed up. It's curing AIDS, hepatitis C, and a bunch of other serious illnesses. The circuit can be built for under \$20 from the instructions in the book. \$10 (#01)

The Secret Guide to Wisdom: This is a review of around a hundred books that will help you change your life. No, I don't sell these books. They're on a wide range of subjects and will help to make you a very interesting person. Wait'll you see some of the gems you've missed reading, \$5 (#02)

The Secret Guide to Wealth: Just as with health, you'll find that you have been brainwashed by "the system" into a pattern of life that will keep you from ever making much money and having the freedom to travel and do what you want. I explain how anyone can get a dream job with no college, no résumé, and even without any experience. I explain how you can get someone to happily pay you to learn what you need to know to start your own business. \$5

The Secret Guide to Health: Yes. there really is a secret to regaining your health and adding 30 to 60 years of healthy living to your life. The answer is simple, but it means making some difficult lifestyle changes. Will you be skiing the slopes of Aspen with me when you're 90 or doddering around a nursing home? Or pushing up daisies? No, I'm not selling any health products. \$5 (#04)

My WWH Submarine Adventures: Yes, I spent from 1943-1945 on a submarine, right in the middle of the war with Japan. We almost got sunk several times, and twice I was in the right place at the right time to save the boat. What's it really like to be depth charged? And what's the daily life aboard a submarine like? How about the Amelia Earhart inside story?If you're near Mobile, please visit the Drum. \$5 (#10)

Wayne's Caribbean Adventures: My super budget travel stories - where I

visit the hams and scuba dive most of the islands of the Caribbean. You'll love the special Liat fare which let me visit 11 countries in 21 days, diving all but one of the islands, Guadeloupe, where the hams kept me too busy with parties. \$5 (#12)

Cold Fusion Overview: This is both a brief history of cold fusion, which I predict will be one of the largest industries in the world in the 21st century, plus a simple explanation of how and why it works. This new field is going to generate a whole new bunch of billionaires, just as the personal computer industry did. \$5 (#20)

Cold Fusion Journal: They laughed when I predicted the PC industry growth in 1975. PCs are now the third largest industry in the world. The cold fusion ground floor is still wide open, but then that might mean giving up watching ball games. Sample: \$10 (#22). Julian Schwinger: A Nobel laureate's talk about cold fusion-confirming its validity. \$2 (#24)

Improving State Government: Here are 24 ways that state governments can cut expenses enormously, while providing far better service. I explain how any government bureau or department can be gotten to cut it's expenses by at least 50% in three years and do it cooperatively and enthusiastically. I explain how, by applying a new technology, the state can make it possible to provide all needed services without having to levy any taxes at all! Read the book, run for your legislature, and let's get busy making this country work like its founders wanted it to. Don't leave this for "someone else" to do. \$5

Mankind's Extinction Predictions: If any one of the experts who have written books predicting a soon-to-come catastrophe which will virtually wipe most of us out are right, we're in trouble. In this book I explain about the various disaster scenarios, like Nostradamus, who says the poles will soon shift (as they have several times in the past), wiping out 97% of mankind. Okay, so he's made a long string of past lucky guesses. The worst part of these predictions is the accuracy record of some of the experts. Will it be a pole shift, a new ice age, a massive solar flare, a comet or asteroid, a bioterrorist attack? I'm getting ready, how about you? \$5 (#31)

Moondoggle: After reading René's book, NASA Mooned America, I read everything I could find on our Moon landings. I watched the videos, looked carefully at the photos, read the astronaut's biographies, and talked with some of my readers who worked for NASA. This book cites 25 good reasons I believe the whole Apollo program had to have been faked. \$5 (#32) Classical Music Guide: A list of 100 CDs which will provide you with an outstanding collection of the finest classical music ever written. This is what you need to help you reduce stress. Classical music also raises youngster's IQs, helps plants grow faster, and will make you healthier. Just wait'll you hear some of Gotschalk's fabulous music! \$5 (#33)

The Radar Coverup: Is police radar dangerous? Ross Adey K6UI, a world authority, confirms the dangers of radio and magnetic fields. \$3 (#34)

Three Gatto Talks: A prize-winning teacher explains what's wrong with American schools and why our kids are not being educated. Why are Swedish youngsters, who start school at 7 years of age, leaving our kids in the dust? Our kids are intentionally being dumbed down by our school system - the least effective and most expensive in the world. \$5 (#35)

Aspartame: a.k.a. NutraSweet, the stuff in diet drinks, etc., can cause all kinds of serious health problems. Multiple sclerosis, for one. Read all about it, two pamphlets for a buck. (#38)

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Code Tape (T5): This tape will teach you the letters, numbers and punctuation you need to know if you are going on to learn the code at 13 or 20 wpm. \$5 (#41) Code Tape (T13): Once you know the code for the letters (#41) you can go immediately to copying 13 wpm (using my system). This should only take a couple of days. \$5 (#42)

Code Tape (T20): Or, you can start right out at 20 wpm and master it in a weekend. \$5 (#43)

Wayne Un-Dayton Talk; This is a 90minute tape of the talk I'd have given at the Dayton, if invited. \$5 (#50)

Wayne Tampa Talk: This is the talk I gave at the Tampa Global Sciences conference-where I cover amateur radio, cold fusion, health, books you should read, and so on. \$5 (#51)

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1999 Editorials: 132 pages of ideas. book reviews, health, education, and anything else I think you ought to know about. \$10 (#76)

2000 Editorials: In the works.

Silver Wire: With two 3-in. pieces of heavy pure silver wire + three 9V batteries you can make a thousand dollars' worth of silver colloid. What do you do with it? It does what the antibiotics do, but germs can't adapt to it. Use it to get rid of germs on food, for skin fungus, warts, and even to drink, Read some books on the uses of silver colloid, it's like magic. \$15 (#80)

Wayne's Bell Saver Kit. The cable and instructions enabling you to inexpensively tape Art Bell W6OBB's nightly 5-hr radio talk show, \$5 (#83) NH Reform Party Keynote Speech. It wow'd 'em when I laid out plans for NH in 2020, with much better, yet lower-cost schools, zero state taxes, far better health care, a more responsive state government, etc. \$1 (#85)

Stuff I didn't write, but you need: NASA Mooned America: René makes an air-tight case that NASA faked the Moon landings. This book will convince even you. \$25 (#90)

Last Skeptic of Science: This is René's book where he debunks a bunch of accepted scientific beliefs - such as the ice ages, the Earth being a magnet, the Moon causing the tides, and etc. \$25 (#91)

Dark Moon: 568 pages of carefully researched proof that the Apollo Moon landings were a hoax—a capping blow for René's skeptics. \$35 (#92)

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This is a monthly magazine, not a daily newspaper, so figure a couple months before the action starts; then be prepared. If you get too many calls, you priced it low. If you don't get many calls, too high.

So get busy. Blow the dust off, check everything out, make sure it still works right and maybe you can help make a ham newcomer or retired old timer happy with that rig you're not using now. Or you might get busy on your computer and put together a list of small gear/parts to send to those interested?

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NEUER SRY DIE

continued from page 62

blue stuff. Yes, of course it's been okayed by the FDA. So how did something that's making so many people sick, and causing them to gain weight in the bargain, get the FDA stamp of approval?

Aspartame was originally discovered at G.D. Searle in 1965. The company submitted some tests to the FDA, which okayed it in 1974. In 1985, Searle was acquired by Monsanto. Despite thousands of complaints both Monsanto and the FDA continue to defend aspartame, which is a major moneymaker, used in thousands of products ... notably in diet drinks.

I have a small two-for-a-buck booklet available that you can give to anyone you know who is using NutraSweet products to alert Ihem.

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QRX . . .

Restructuring: General and Extra Class Skyrocket

The number of people who have upgraded as a direct result of restructuring the United States Amateur service has skyrocketed. So says the keeper of the numbers. Fred Maia W5YI.

Maia, who operates the W5YI VEC, says that while

the total number of radio amateurs has only increased one half of one percent since restructuring was introduced last spring, in the area of upgrades the numbers are startling. For example: There are now just over 15,000 more Extra class hams than a year ago. That's an increase of a solid 20 percent. And the General class is up by nearly

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NEVER SRY DIE

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Mired

Some of us are mired in the past, most are mired in the present, and a few raise their mental eyes, looking at the future. Which explains why so few people have been able to take advantage of the opportunities that the future has offered.

We've been through some major technological changes in amateur radio. In the 1920s, we went from spark to CW, with the "Spark Forever" group fighting change to the last ditch. Then came the change from MOPA to crystal control in the early 1930s. On VHF, we went from superregenerative receivers to superhets, and from modulated oscillators to crystal control in the 1940s. Old-timers around Brooklyn still remember Oscar W2KU's half-kilowatt modulated oscillator, which took up a large part of the 2m band in the late '40s.

In the '50s, we had the SSB/AM battle, with W2OY making a memorable nuisance of himself fighting SSB. RTTY made it to the HF bands, despite every dirty trick the ARRL could think of to stop it. They were afraid that RTTY would obsolete their National Traffic System (NTS), which had hundreds of amateurs spending their evenings relaying thousands of inconsequential messages by CW around the country, making like Western Union offices. Well, that was the basis for the American Radio Relay League — relaying. Will someone check QST and see if the Brass Pounder's League is still in operation? Maybe one of you historians will write an article about the

We've put up some ham satellites, but we haven't gone very far with that technology, so not much has come of it. We tried fast- and slow-scan TV, but we ran into the same problem as commercial TV — a lack of interesting programming. How many Playboy pictures do you want to watch slowly scroll down your screen?

In the early 1970s, 2m came alive when NBFM and repeaters got going. Our repeater technology soon attracted the interest of Motorola and GE, bringing the public cell phones, which are now slowly frying the brains of people all around the world.

Computers, first introduced in 1975, had us sending packet messages, and making RTTY possible without having to get an obsolete Teletype machine.

The almost total destruction of the American ham industry and most of the school radio clubs by the ARRL's socalled Incentive Licensing disaster in the mid-'60s may help explain why the development of new communications technologies by hams has gone almost nowhere in the last 25 years. Inventing and pioneering are young man's games, and our source of young hams, the school radio clubs, were killed off by the League. Thanks.

I've discussed several new technologies in my columns which could be very profitably developed, but I haven't seen signs of any readers picking up the ball on them.

2020?

Blow the dust off your word processor and let's see



radio in the year 2020. Will we have any new modes by then? More ham satellites? Ties with the Internet? Will we still need DXpeditions? Will we even have amateur

Are there any new technologies we can help pioneer?

While I expect to see less and less commercial (and military) interest in the HF spectrum, I'll be surprised if we're not squeezed out of our microwave bands. Between fiber optic systems and satellites, the commercial world is trying to cope with the ever increasing need for communication bandwidth.

It started with smoke signals, then flashing lights and the Pony Express. Then came the telegraph and radio starting with spark. Now we're sending TV over the Internet!

What bands do you think we'll still have by 2020, and what modes will we be using?

Since amateur radio is no longer of the slightest interest to the military, either as a source of operators or technicians, or even as a way to reserve frequencies for use in time of war, we've lost a powerful ally, while gaining no friends.

Let's see what you can come up with. Yes, please include a disk copy.

Messing with the Green Man

The success of my guesting on the Coast To Coast AM show (the old Art Bell W6OBB show), got me a call what you predict for amateur | from the producer of a show on shortwave station WWCR 5070, out of Nashville. Sure, I'll be a guest, I enjoy being on shows where I can talk about the excitement and adventure that amateur radio can provide.

The show is on from 11 to 12 Saturday nights (EST), so they called me at 11 and I listened to the two hosts. Stan Olochwoszcz N2AYJ and Mark Emanuele N2CBO. waiting to be introduced. Instead, they joked with each other, about things of little possible interest to any listeners. After 15 minutes of this, there was a commercial break and then they introduced me, but I had a hard time getting anything in between their interruptions. Then came another commercial break, after which they opened the phone for callers to ask questions. A few minutes later, the program was over. What a ridiculous waste of time!

I called the producer and told him what I thought of his hosts, and in particular Stan, who just didn't seem to be able to shut up.

A few days later the producer called and asked if I'd come back on the next Saturday night if I could be my own host and run the show. Well, okay, I'll give it a try. He faxed me an outline of the topics he suggested I cover. It looked good to me.

At 11 I was on the phone again, ready to go. But instead, there were Stan and Mark, talking about their RVs for fifteen minutes. Then, after a few commercials, Stan

Continued on page 61

NTS and BPL.

continued from page I

18,000. That's just a bit more than 33,000 upgrades.

Maia notes that the increase in these two license classes is a direct result of the elimination of the 13- and 20-word-per-minute Morse tests. It has also resulted in a diminished number of hams holding the Tech Plus and Advanced class tickets

Thanks to W5YI, via Newsline, Bill Pasternak WA6ITE, editor

The Internet: WWW not WW

Only one in 20 people around the world are online, and close to 60 percent of Internet users live in North America. This, even though the region accounts for just five percent of the world's population. In Africa, there are a mere 14 million phone lines. That is fewer than are found in either Manhattan or Tokyo.

But even in North America, the Internet is not within the reach of everyone. The research firm Jupiter Communications, Inc., says there are yawning Internet-use gaps in the U.S. between high-income and low-income households, ethnic groups, and age groups. According to Jupiter, sixty percent more white households in the U.S. are online than African-American households, and the elderly account for only sixteen percent of the country's Internet-user community.

While many of these gaps are expected to close in a few years, internet content is still likely to target well-heeled, well-educated, and mostly English speakers, because of advertising and e-commerce.

Thanks to Internet Futures newsletter, via Newsline. Bill Pasternak WA6ITF, editor.

Sub Standard

The Port City ARC, located in Portsmouth NH, set up a ham radio station on the USS *Albacore* on Saturday, July 15th, and Sunday, July 16th, to join more than 50 others on military ships now set up as museums in a ham-radio operation dubbed the "Museum Ship Special Event."

This event was to commemorate those men and women who operated radios in the maritime service, as well as the maritime service in general. As noted, the Port City ARC operated a station onboard the USS *Albacore*, reviving her memory and honoring all those who worked and served on this experimental submarine. In fact, the USS *Albacore* is a National Historic Landmark, as well as a Historic Mechanical Engineering Landmark. Visitors to the Port of Portsmouth Maritime Museum and Albacore Park during those two days were able to observe the ham radio operators as they worked with both voice and Morse Code.

A few familiar names among the armada of ships were:

- Submarines USS Pampanito, USS Torsk, USS Croaker, USS Cod, USS Requin, USS Cavalla, and USS Drum (where Wayne Green served during WWII).
- Destroyers USS The Sullivans, USS Kidd, USS Laffey, USS Slater, HMCS Haida.
- Cruisers USS Salem, USS Little Rock, HMS Belfast.
- Battleships USS Massachusetts, USS North Carolina, USS Alabama, USS Texas.
- Aircraft carriers USS Yorktown, USS Lexington, USS Hornet.

In addition, hams set up stations in and on museums associated with victory ships and freighters, frigates, mine sweepers and mine layers, lightships, sternwheelers, and even a salvage tug. These ships are located throughout the United States as well as in other countries, including Canada, England, The Netherlands, Denmark, Sweden Finland, and Germany.

Ham radio operators around the world earned certificates and awards by making contact with the highest number of these ships during that weekend. In addition, hams as well as shortwave listeners were able to request commemorative QSL cards from individual ships. All in all, this special event set a standard that future similar ones will be hard-pressed to meet.

The chief organizer of this event was the USS Salem Radio Club in Quincy MA. They operated with the distinguished callsign K1USN.

For extensive details about the Museum Ship Special Event amateur radio operation, see the Web site at [www.ziplink.net/~rcal/salem]. For information about the Port City ARC and its activities, check out the club's Web site at [www.gsl.net/pcarc/] or call (603) 427-1377.

Thanks to Daniel Sawyer W1PIE and the Port City (Portsmouth NH) ARC.

Motorola to Destroy Iridium Satellites

Now there's word that the bankrupt Iridium satellite communications system will be de-orbited and permitted to burn up in the Earth's atmosphere. This as Motorola announces plans to begin the destruction of its failed commercial satellite telephone system.

According to news reports, controllers may have already been given the go ahead to begin the de-orbiting process for the sixty-plus microsats. The exact timetable for the destruction of all of the tiny birds should be announced soon (if not already).

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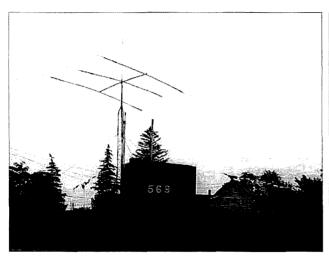


Photo A. The 20-meter beam was erected near the submarine.



Photo B. Paul Schreier AAIMI operated from the sub's radio room. He and four other club members worked the two-day event to rack up 443 contacts under the club call WIWQM.

From the Ham Shack

G. William Forgey K7KDU, Lynnwood WA. I have been reading your magazine(s) now for over 40 years. From CQ to 73 to VHFer to BYTE to KILOBAUD, and like that. You are therefore in large part responsible for my technical education, bad attitude about government boondoggles, contempt for the ARRL "CW Forever" attitude, and tendency toward independent thought. Thank you. I never took the time to similarly thank John Campbell and I regret it. Thankfully, I did manage to let my old friend Don Stoner know how much I had learned from him before he tripped off this mortal coil. But I digress ...

It now seems that about 35 years after most cognizant beings had concluded that the ARRL "CW Forever" crowd were a group of irrational, elitist spoilsports, the FCC has finally come to the same conclusion. And now, to my everlasting amusement, I find that my despised Technician Class ticket, obtained through a volunteer examiner during my pre-1960 Navy days, has metamorphosed into a General Class by act of God. Sorry. Act of FCC. Kafka would be so proud of me.

Don't get me wrong. I love CW. Some of my best friends and relatives use it. But, as I told Stoner years ago, CW is like many other perversions: Best practiced in the dark. Alone.

It was wise of the FCC and ARRL to keep me with my lowly Technician Class ticket from enjoying (if that's the word) the HF spectrum all these years. My congenital disinterest in learning to copy CW at warp speed is obviously a sign that I am unfit, unclean, and perhaps too brain-damaged to be permitted to pollute the precious HF airways. I have had to console myself with the lesser thrills of designing and building communications equipment which ranges in frequency from 160 kHz to 24 GHz, digital toys to enhance my limited intellect (remember the Cosmac Elf?), and start a business or two in my garage.

Imagine, if you will, how vastly different my miserable, unproductive life might have been had I but accepted the wisdom of the ARRL, buckled down, and "got that old code speed up." Hell, I might be, even now, swishing my VFO across some 75 meter net which dares to let people express honest differences of opinion. Or arguing endlessly about just who is actually "on" the net.

I've seen the light, Wayne. I swear that I shall, now that the FCC has seen fit to grant me this HF access in spite of my miserable CW record, make every effort to alter my behavior. I shall never again actually build my own equipment. I will prattle endlessly about the details of technology I clearly do not understand. Preferably on some "oldtimers" net. I will strive to convey to all and sundry that I, as an FCC-certified HF operator, am now a member of that elite cadre of hams who knew what it was like in the "old days." You know. Back when ALL hams were true technology experts. When ALL hams could copy 25 wpm. Through summer static. Uphill. Both ways. Through two leet of snow. Sigh ...

How I miss people like K1CLL, W1OOP, W1FZJ, K2ORS and W6TNS. They have been, through your magazines (and others, I admit it), my teachers and mentors.

My interest in amateur radio dates to 1948 when I first built a radio using a MELO-MITE radio crystal gleaned from the microtype in the back of a Boy's Life magazine. Since that time, I have watched as technology that can only be described as magic (Clark's Law) has been incorporated into everyday life. I've even contributed my share to that trend through my years as a designer. And, like you, I have railed at the idiocy of an entrenched and foolhardy group of elitists who have, through their intransigent and selfish insistence that high-speed CW be used as a criterion to obtain a "real" ham ticket, killed the hobby that I've loved all my life.

The move to de-emphasize CW as a filter into ham radio is certainly long overdue. And, although I hope not, probably too late.

Keep up the good fight, Wayne. We need you NOW more than ever.

Kenneth E. Stone W7GFH, Cherryvale

KS. I read with interest the "Cold Fusion, Hot Speculation" food for thought article in the August issue of 73, and I have given it much thought. My first impression was that it was a misplaced April article. My next thought was wondering if the author put more knowledge into his consultation with physicists and chemists than the article indicated about his knowledge of physiology and metabolism.

The relation between work and food metabolism has been very thoroughly studied

for generations from many aspects. There are no magic or mystery energies involved. It is like all other energy balances straightforward and unambiguous. Consider the "horse sense" item. I don't have the exact figures for the horse, but a couple of ways of looking at it show how wrong the author is. It has been determined that a soldier doing jungle marching will use or expend about 0.1 Kcal per kg per minute. The horse is certainly as efficient as the soldier, and likely more so, so the typical riding horse of 600 kg would expend about 3600 Kcal per hour. That is equivalent to metabolizing only 32 oz of carbohydrates and protein or 14 oz of fat per hour. Looking at it another way, suppose the horse were expending energy at the rate of one horsepower (what else?). That is equivalent to 640 Keal per hour. That can be obtained from 5.6 oz per hour of carbs or protein or 2.5 oz of fat per hour. It has been found from actual measurements that optimally loaded muscle is 25 to 30 percent efficient, about the same as a gasoline engine. At 25% efficiency the horse would require 22.6 oz. per hour of carbs or protein. This is pretty darned close to the soldier way of looking at the problem. This kind of problem is old hat and there just aren't any mysteries in it! Beware of "horse sense"!

The energy to climb stairs has been laboratory-measured. For me to climb 2.6 meters would require me to metabolize 2.88 Kcal or 1.39 grams of carbohydrate. My increase in potential energy at the new altitude amounts to 0.49 Kcal. This works out for me to be 17% efficient. This answer is certainly within reason considering optimally loaded muscle may be only 25% efficient. No mysteries!

As for the birds, they don't fly all those miles on a handful of bugs. They store up plenty of fat, and fat has essentially the same fuel value as gasoline or diesel. There are no mysterious energies involved. It is a fact that the oxidation of a fuel, such as a carbohydrate, to carbon dioxide and water yields exactly the same amount of energy no matter whether the oxidation takes place in a flame or slowly in animal metabolism.

As for cold fusion, it seems no one knows whether it does or doesn't work. Whatever the end results, there will not be any mystery to it.

Build This IP3 Test Set

A receiver's third order input intercept point is more than just a mouthful.

Receivers for shortwave and amateur use need to be able to hear weak signals without creating distortion from adjacent strong ones. In a poorly designed receiver, distortion can completely override and mask out a desired but weak station. One number in a receiver's spec sheet that tells you just how good it is in preventing distortion is the third order input intercept point — IP3. But what does that mean? And how is it measured?

ny circuit handling more than one signal will create some distortion. If two steady radio frequency signals at, say, 14,060 kHz and 14,080 kHz, enter the antenna terminals of a receiver, then by tuning the receiver we can separate and identify these two signals at two points on the tuning dial. However, due to nonlinearities within the receiver's circuits, there will also be weaker signals

found at 14,040 kHz and 14,100 kHz. Where did these come from? The two weaker signals are called third order distortion products. If you are trying to listen to a weak station at 14,040 kHz, you might not be able to hear it because the distortion product generated in the receiver itself could be stronger than the station you are trying to hear. No amount of tuning or IF filtering can separate the distortion product from

the desired signal. It sits right on top of what you want to hear.

Nonlinearities in the receiver's RF amplifier and mixer circuits create harmonics. The second harmonic of 14,060 mixes with 14,080 to produce 14,040 kHz. Likewise, the second harmonic of 14,080 mixes with 14,060 to produce 14,100. The mixing can occur in the receiver's mixer circuit or even in the RF amplifier. Remember, nonlinear devices make good mixers.

Understanding IP3

The top line in the graph of **Fig. 1** shows the output versus input level of a mixer circuit. Mixers have two inputs. In this case, the input on the graph is the signal input. The oscillator

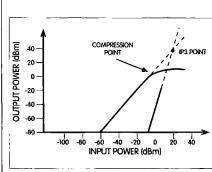


Fig. 1. Intermodulation graph.

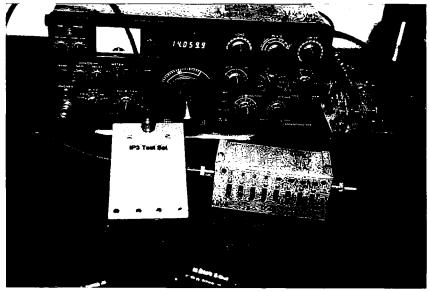


Photo A. Measuring intercept performance of a receiver.

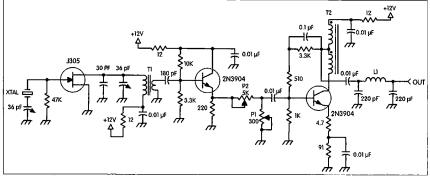


Fig. 2. Generator schematic diagram. T1 = primary 21T #22 wire on T50-C core; secondary 3T #22. T2 = 7 bifilar turns #26 wire on FT 23-43 core. L1 = 12T #22 wire on T37-6 core.

input is held at a constant level. Both scales are measured in units of dBm or power in dB above one milliwatt. We see that the mixer has a gain of 10 dB and can handle signals up to about 10 dBm (10 milliwatts) at the input and then flatten out. The line has been artificially extended to higher levels with dots, but note that the mixer does not operate at the dotted points.

Suppose two equal strength signals are fed into the mixer. Each one has the level shown on the horizontal scale. Then there will be two outputs, each one having a level equal to the vertical scale as read using the top line of **Fig. 1**. In addition, there will be the two weaker IP3 distortion product signals. The level of each IP3 signal at the mixer output is shown by the lower line in Fig. 1. You immediately notice that the slope of the lower line is three times that of the upper line. This is the way distortion products usually work. Again the lower line has been artificially extended by a dotted line.

The point at which these two dotted lines cross is called the IP3 point. The corresponding level on the horizontal axis is called the input IP3 level and

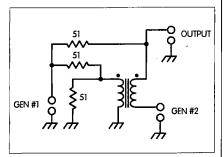


Fig. 3. Hybrid combiner schematic.

the corresponding vertical axis level is called the output IP3 level. When a spec sheet does not specifically indicate which, it is usually referring to the input IP3 level.

When comparing two mixer circuits, the higher the input IP3, the lower the distortion products will be. A good mixer has a high input IP3 point. Keep in mind, however, that the mixer is not capable of operating at the IP3 point. It's just a way of comparing two mixers. The mixer can only reasonably handle signals up to the point at which the output flattens out, called the compression point.

How is IP3 measured?

In order to measure the IP3 point of a circuit, you need to inject two fairly strong independent signals into the circuit. They need to be strong enough to create measurable distortion products.

The signals also need to be combined without creating distortion before they get to the circuit under test. One good circuit for producing a signal is shown in Fig. 2. A circuit board pattern is shown in Fig. 4. Component locations are shown in Fig. 5 and Photo B. A crystal oscillator with a high-Q tank circuit, and low loading on the crystal, generates a clean signal with low phase noise. Inductor L1 has a Q of over 250. See the Radio Components Handbook for more information on constructing high-Q inductors. A JFET transistor, J305, is used in the circuit. An MPF102 would be an acceptable substitute.

An emitter follower using a 2N3904 NPN transistor isolates the oscillator



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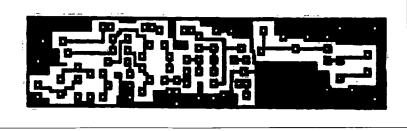


Fig. 4. Printed circuit pattern for generator (100%).



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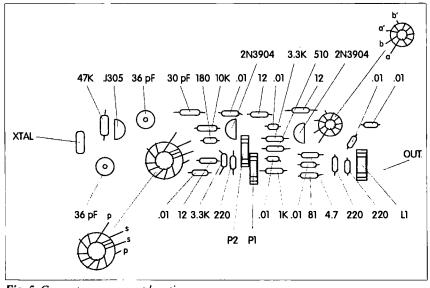


Fig. 5. Generator component locations.

circuit from any load variations that might modulate the oscillator and cause distortion.

A final power amplifier circuit is configured using trimpots P1 and P2 to provide an exact 50 ohm output at a level of 6 dBm.

Set for 50 ohm output

Negative feedback in the power amplifier circuit provided by the 510 ohm resistor means that the output impedance is dependent on the input impedance. Trimpot P1 is adjusted first for a 50 ohm output. A higher value of P1 produces a lower output impedance. 1 used the setup shown in **Photo D**. An MFJ-259 SWR analyzer

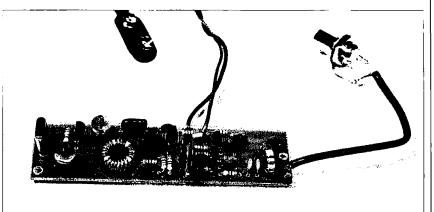


Photo B. Signal generator board with components.

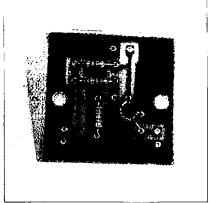


Photo C. Hybrid combiner.



Fig. 6. Printed circuit pattern for hybrid combiner (100%).

set for 14,070 kHz measures the output impedance. Supply voltage must be applied to the power amplifier and emitter follower, but the crystal oscillator



Photo D. Setting the output impedance.

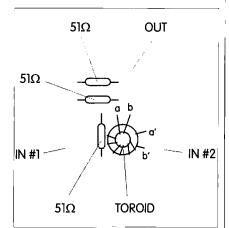


Fig. 7. Hybrid combiner component locations.

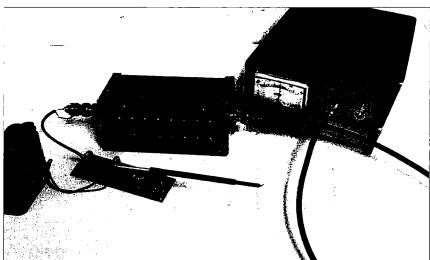


Photo E. Setting the output level.





Photo F. Circuit boards mounted in box.

must be disabled. You can disable it by removing the crystal or by temporarily shorting the crystal leads together.

Next, insert the crystal and adjust the 36 pF trimmer in parallel with T1 until a signal appears at the output. The 36 pF trimmer in series with the crystal can be adjusted to set the exact frequency. Then, as shown in **Photo E**, P2 is adjusted for a 6 dBm output into a 50 ohm load. The dBm meter described in the November 1995 issue of *Electronics Now* can be used to

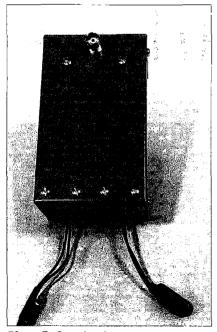


Photo G. Completed test set.

Table 1. Parts list. A complete kit of parts, including two generators, combiner, and drilled case, is available for \$60 plus \$4.50 shipping from Unicorn Electronics, Valley Plaza Drive, Johnson City NY 13790; (800) 221-9454; [www.unicornelex.com]. Kits for the dBm meter and step attenuator are also available from Unicorn. A set (3) of etched and drilled circuit boards for the IP3 test set is available for \$10.

measure the level. You will also need a step attenuator, such as the one described in the April 1999 issue of *Electronics Now*, to drop the 6 dBm level down to where the dBm meter can read it. Note that a 50 ohm low-pass filter L1 and the two 220 pF capacitors in the output reduce any harmonics on the signal. The 6 dBm level should be measured after the signal passes through the low-pass filter.

Two such circuits are needed, with crystals 20 kHz apart. To prevent any interaction between them via the power supply, it is best to power them separately using battery packs. Two packs of eight AA cells each, as shown in the photos, is satisfactory.

Hybrid combiner

The two signals must be combined before injection into the test circuit. The 6 dB hybrid 50 ohm combiner using a ferrite transformer shown in Fig. 3 works well. A circuit board is shown in Fig. 6. Component locations are shown in Fig. 7 and Photo C. Note that this circuit must be fed with two 50 ohm sources and be terminated with a 50 ohm load. Both generators must be powered on for the levels to be correct. Each signal will be at 0 dBm at the output.

Building the test set

A complete test set consists of two generators and a hybrid combiner. All three can be included in a single shielded box as shown in **Photo F**. For those who prefer, a complete kit is available. See the parts list, **Table 1**. The completed IP3 Test Set is shown in **Photo G**.

Making the measurement

Photo A shows a typical test setup.

For	each signal generator:				
1	4.7 Ω				
3	12 Ω				
1	91 Ω				
1	220 Ω				
1	510 Ω				
1	1k				
2	3.3k				
1	10k				
1	47k				
1	300 Ω trimmer				
1	5k trimmer				
6	0.01 μF disc ceramic				
1	0.1 μF monolythic				
2	36 pF trimmer cap (purple)				
1	30 pF silver mica				
1	180 pF silver mica				
2	220 pF ceramic				
1	crystal, 14060 or 14080 kHz				
1	J305 FET				
2	2N3904 NPN transistor				
1	T37-6 powder iron core (small yellow), wind with 12T #22 wire (orange), use 7"				
1	T50-6 powder iron core (large yellow), wind primary 21T #22 wire (orange), use 15"; wind secondary 3T #22, use 3"				
1	FT23-43 ferrite core (small black), wind with 7 bifilar turns #26 wire (green), use two, 5" each				
1	Circuit board				
For	the hybrid combiner:				
3	51 Ω				
1	FT23-43 ferrite core (small black), wind with 10 bifilar turns #30 wire (small orange), use two, 7" each				
1	Circuit board				
For	the case:				
1	Hammond 1411N utility box, 5 x 3 x 2.2"				
1	BNC chassis mount connector				
2	1/4" grommets				
2	Battery snaps				
8	4-40 pan head machine screws 3/8" long				
24	4-40 hex nuts				
24	T-TO HEX HUIS				

A step attenuator is used between the IP3 test set and the receiver to be tested. In the photo, the receiver is my Kenwood TS-830S transceiver. An old

Input IP3 (dBm)	Rating
>10	Outstanding
0 to 10	Very good
-10 to 0	Good
-20 to -10	Fair
<-20	Poor

Table 2. Rating 1990s-era receivers.

product review in QST lists an average IP3 at 14 MHz as -9 dBm.

Connect up the batteries and locate the two crystal oscillator signals. These signals will be extremely strong and you will need to switch in some attenuation to get a reasonable reading — say S9 levels for the distortion products. The two input signals will be much stronger. Now tune to one of the IP3 distortion product frequencies and note the signal level on the receiver Smeter. Tune back to one of the crystal oscillator frequencies and switch in additional attenuation until the signal level is the same as the distortion product signal was. IP3 is then calculated from:

IP3 = Original Signal Level + 0.5 xAdditional Attenuation

The original signal level is 0 dBm minus any attenuation you started with on the step attenuator. Note that this procedure measures input IP3 but not output IP3.

For my measurements of the Kenwood receiver, I used 36 dB attenuation to produce two distortion signals at S7 on the receiver's signal strength meter. Then, tuning to one of the generator frequencies, an additional 52 dB was required to reduce this signal to S7. From the previous equation, then:

$$IP3 = -36 + 0.5 \times 52 = -10 \text{ dBm}$$

which agrees approximately with the ARRL's average of -9 dBm.

From my experience, I would use the chart in Table 2 to rate 1990s-era receivers. Even very good older receivers will fall further down on the chart.

With this test set, you can make accurate IP3 measurements of your receiver's distortion performance. Good luck with the building and with the measuring!

Further reading

"Build a Step Attenuator," Electronics Now, April 1999, pp. 34-37; correction, June 1999, p. 7.

"dBm Meter," Electronics Now, November 1995, pp. 112-113, 158-159. Ladder Crystal Filters, John Pivnichny N2DCH, MFJ, Starkville MS, 1999.

"Product Review: Kenwood TS-830S," QST, May 1981, pp. 38-40.

Radio Components Handbook, Guido Silva I2EO, MFJ, Starkville MS, 1998.

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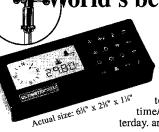
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Inside Digital TV/VCR Tuners

Part 3: Data receiver for testing.

The discussion on digital TV/VCR tuners is in seven parts with the first part covering the two types of digital tuners and their requirements. A short discussion was provided regarding how the synthesizer is used within the tuner for controlling the local oscillator (VCO). Part two discussed the data transmitter that I built to control and study the digital tuner.

hile building the data transmitter to be used in controlling a digital tuner, it became obvious that a method was required to "observe" and test the data transmitter. The solution was to develop a data receiver that would drive a series of LED's displaying the tuner's data

control bits sent by the transmitter. Sending data into a digital tuner is illusive because the tuner normally provides no direct feedback of "what's happening." Although the receiver isn't a necessary part of the test and data set, it provides visual feedback to the operator of what has been sent to the digital tuner.

LSD MSD +5V 8-BIT 8-BIT DATA IN SHIFT SHIFT SHIFT REGISTER REGISTER REGISTER · CLOCK IN CLEAR MANUAL CLEAR **SWITCH**

Fig. 1. Block diagram of the data receiver. Each shift register drives eight LEDs. 16 73 Amateur Radio Todav • November 2000

The theory behind the data receiver is shown as a block diagram in Fig. 1. Data flow through the circuit is shown by the arrow pattern. Data from the transmitter is clocked into three cascaded shift registers having 8 bits each. Each of the 24 register bits has an output that drives an LED indicating the status of the register bit. Only one LED driver is shown in the figure, but there are eight identical drivers for each register bit in the actual data receiver. Displayed data in the registers is cleared manually with a push-button.

The circuit for the receiver, shown in Fig. 2, uses three cascaded 74HCl64 shift registers. Again, TTL 74l64 ICs were used in the initial design, and they worked just fine - that is, until certain data patterns appeared that would glitch and turn off portions of the display. The use of the 74HC164 solved the problem without further error. Troubleshooting of the glitch condition failed to show up where the problem was occurring, but use of the 74HC164 part resolved the problem.

The 74HC164 was selected for the receiver application because it is a serial-data-in and a parallel-data-out

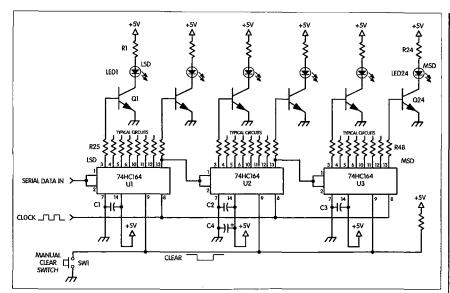


Fig. 2. 24-bit serial data receiver. Displays data sent to a digital TV/VCR tuner.

shift register. A "1" bit at a register location creates a HIGH on the respective output pin of the register.

Then, to drive an LED, a switching transistor was used as an LED driver. While in operation, it's interesting to watch the data bits move through the registers as the appropriate LEDs illuminate, making it clear to the user as to what's happening relative to the data being sent to the tuner.

Packaging

With twenty-four output circuits driving twenty-four LEDs, the mechanical space requirement for them became extensive. In order to reduce the LED crowding, the narrow flat LED package was chosen for the receiver project. TO-92 packaged transistors were selected for the LED driver application because they would stack close together. I used the equivalent of the 2N4401

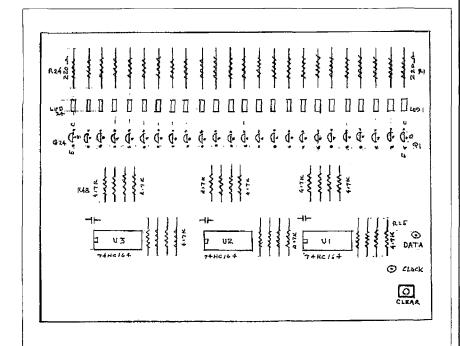


Fig. 3. Component placement for the data receiver.

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Parts List for the Data Receiver		
R1-25 220Ω 1/4 W resistor		
R25-49	4.7k 1/4 W resistor	
C1, 2, 3	0.01 μF 50 V ceramic capacitor or equiv.	
C4	100-500 μF 16 V radial capacitor or equiv.	
	Rectangular LED (color is optional)	
LED 1-24	Red: Mouser 606-CMD 57123, Digi-Key P437-ND (Panasonic LN242RP)	
	Green: Mouser 606-CMD 54123, Digi-Key P438-ND (Panasonic LN342GP)	
Q1-24	2N4401 or equiv. TO-92 or smaller case size	
U1, 2, 3	74HC164 8-bit shift register: Mouser 511-M74HC164, Digi-Key 296-2097-5-ND	
SW1	SPST momentary push switch, any type available	
Misc.	IC sockets	

Table 1. Parts list for the data receiver.

device as an LED driver, but almost | fit the mechanical spacing available. any NPN transistor should work well

Because the "received" data is to be in this application as long as it will | retained in the display, the CLEAR

line is operated by a push switch located on the receiver board. Only the data and clock lines are connected in parallel with the data transmitter and the digital tuner.

The circuit of the data receiver is fairly simple and can be laid out easily on a printed circuit board as shown in Fig. 3. A parts list is shown in Table 1. Spacing of the LEDs and driver transistors are the primary controllers of the space and size of the board. Carrying a ground to the transistor emitters was accomplished by using "Z"-wires to transfer the ground from the upper side of the board to the lower.

With the exception of using the 74HC164 shift register, the remaining components used in the project appear to be noncritical as to value. I used IC sockets on my receiver board to allow switching of chips during trouble-

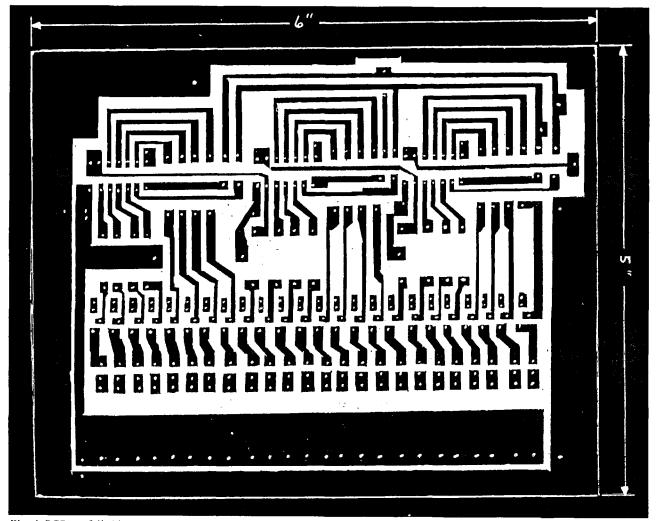


Fig. 4. PCB top foil side.

shooting. No apparent problems are introduced through the use of the sockets.

I used discrete resistors on my receiver board, but with a board design change it would be possible to use resistor packs. Some board real estate would be saved with the use of R-packs, should board size be of concern.

All of the logic is on the circuit side of the board, leaving the top side of the board for ground plane. Some power circuits and jumper wires are carried on the top side of the board for convenience.

A small momentary push switch is installed on the top side of the receiver board and is used for resetting the display when it is deemed desirable. Resetting of the display has no effect on the data sent to the tuner, as that is strictly under the control of the data transmitter.

What's next

Part four in this series on digital TV/ VCR tuners will discuss how the tuner is to be controlled and tested. The fifth part will provide a BASIC program that may be used for the decimal to binary number conversion, since the tuner responds to a binary number format. Parts six and seven, the last sections of this series, will provide a simple technique for making printed circuit boards.

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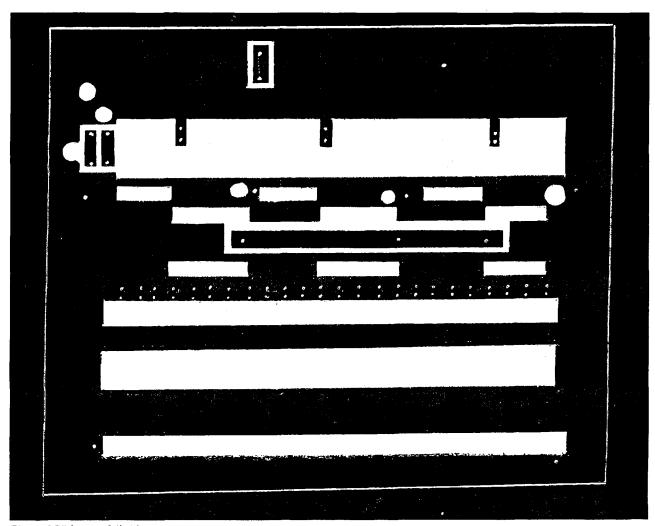


Fig. 5. PCB bottom foil side.

73 Review

73 Tests the Drake SW1 Receiver

Contact your dealer now to get one while you can.

My first exposure to shortwave listening came during the summer after I graduated from elementary school. My dad gifted me with a Zenith Transoceanic Portable Shortwave Radio, and my summer before beginning high school was spent at my aunt's home in a small Wisconsin town called Platteville. Platteville had a year-round population — not counting the cows — of about 2,000, and was the home of one of the University of Wisconsin's colleges specializing in education. The students added maybe another 1,000 or fewer souls to the town, and trust me, there was nothing to do, other than visit old Ozzie's farm and watch the cows get milked.

Today, on the other hand, Platteville has changed, grown up so to speak, and hosts the training camp for the Chicago Bears football team. The town is still on the small size, not a great deal to do, so maybe that's why it hosts the Bears' training facility. Nothing but football to think about.

But that summer, it was nothing but shortwave listening on my mind. I listened from early morning to what must have been early the next morning, and logged many stations in as many foreign

countries as I could count. I learned from a local ham how to make out QSL or SWL cards and get verifications from these countries, which made the local postman somewhat more than just a bit curious as he questioned Aunt Bea as to why her nephew was getting mail from Moscow (Radio Moscow that is). The bug had bitten, and one night, probably actually early in the morning, I heard a short news update from Sydney. Australia, concerning a flash flood which had destroyed the

wool warehouses and their entire stock of wool. At breakfast a few hours later. I related the story to Uncle Harry who just so happened to be a wool broker, and some hours later he came home to tell us that the East Coast boys tried to pull (pardon the pun) the wool over his eyes on pricing for wool. Seems that they claimed they could get the wool cheaper from Sydney. Uncle Harry told them fine, try to get it, then call me back. The rest is family history.

For years, I've wanted a quality shortwave receiver to replace the venerable Zenith, and recently I came across an advertisement from a 73 advertiser (naturally), Universal Radio [www.universal-radio.com]. They were offering a receiver, AM only, from the legendary R.L. Drake Company [www. rldrake.com1 for less than \$200. The XYL feigned sleep as I ordered the unit. and three days later a small box arrived. As you can see from Photo A. it's a compact and attractive addition, even to the family room. But I'm like most Hams I know, and appearance is secondary. How well would it perform. and what else could I do to make it even better? Table 1 lists the technical specifications of the SWI.

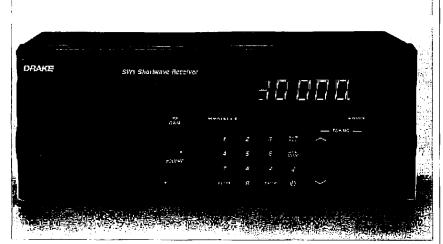


Photo A. Drake SW1 shortwave receiver.20 73 Amateur Radio Today • November 2000

Frequency range, AM only	100–30,000 kHz			
Sensitivity (10 dB S+N/N) (1000 Hz, 30% mod.)	Less than 2.0 μV typical			
Readout accuracy	To nearest 1 kHz			
Selectivity	5.5 kHz min. at -6 dB			
IF frequency	1st IF: 45 MHz 2nd IF: 455 kHz			
Step sizes	1 kHz with tuning knob 5 kHz with up/down buttons			
Antenna inputs	SO-239 coax connector 50 ohms Screw terminals 50 ohms			
Headphone jack	1/8-inch stereo/mono type (monaural reception only)			
AC adapter	Supplied			
Wall transformer	Input 120 VAC 15 W Output 12 VDC @ 830 mA (max.)			
DC power requirements	12 VDC @ 400 mA nominal			
	Width: 10-7/8 in.			
	Height: 4-3/8 in.			
Size	Depth: 7-5/8 in. (includes front knobs and rear panel connectors)			
	Weight: 4.7 lbs.			

Table 1. Technical specifications.

The one thing that jumped out at me was the standard second IF of 455 kHz—not that this was unusual. but rather knowing that the small BFO kit I'd purchased from Ten-Tec would make this a general-coverage as opposed to an AM-only receiver. Besides, the schematic showed that the two sets of antenna connectors were common, or in parallel, so that I could couple the BFO to the screw terminal and my station antenna (receive only) to the SO-239.

Another added goodie which I hadn't seen since my military days was an NE-2 neon bulb across the antenna terminal to ground. Most if not all military

receivers had this feature; in case of static electric discharge across your antenna (and maybe even a brief lightning strike), the charge would "turn on" the neon bulb and conduct the charge 'harmlessly away' from your sensitive equipment. To be honest, I have never seen it happen, or for that matter the bulb turn on, but theorywise, it should work — and besides, it's a cheap form of extra insurance.

The receiver itself was a joy to operate. The small manual essentially told you everything you needed to know to operate the receiver and how to program the memory channel list with your favorite frequencies so that a single keypad entry would take you directly to Radio Moscow, or the BBC. or HCJB in Ouito, Ecuador, with ease. Frequency selection was made by either direct keypad entry or by using the tuning knob and the up and down buttons. The tuning knob increases or decreases the frequency in 1 kHz steps, and the up/down buttons increment the displayed frequency in 5 kHz steps. In fact, for the most part, the receiver responded much in the same way as my current transceiver in the receive mode, minus the CW/SSB and FM capabilities.

Our antenna was a longwire, approximately 110 feet in length, going from the rear of our house to a large tree about 35 feet in the air in an unused area of the yard. The wire was brought into the basement by drilling a small opening in the caulking compound surrounding our furnace vent pipe. This technique may or may not be suitable to your location. We have one of those super-energy-efficient gas furnaces with a handful of heat exchangers, so that the old metal vent pipe is now replaced by a 3-inch diameter plastic pipe, and at full blast the air coming out is just barely warm. After snaking the antenna wire lead inside, it was connected to a length of RG-58 coax, and the shield of the coax was grounded to the copper cold water pipe after first verifying that there was a conductive path from the pipe before the water meter, to the pipe after the water meter. The cable was then run into the den, terminated in a PL-239, and connected to the SW1.

Actual use and comments

Once I got used to the small size of the receiver, I found it to be quite sensitive. I was able to easily find and listen to many of my old favorites such as the dramas on the BBC, and I could readily pick out the fading in, then out of Radio Moscow - some things never change. The real challenge was to find stations — or more accurately where they can be found. In my early days as a lad, there were directories of shortwave stations with their frequencies and times of broadcast. As I recall. Popular Electronics, to mention one magazine, had a shortwave listening column with updates, time changes, and schedules. I'm going to have to surf the Web a bit, I suspect, as these sorts of information seem to have gone from the more hobby-based magazines into a sort of limbo.

Considering the reasonable cost, the small footprint on my already crowded desk, and the pure pleasure of listening to a good British murder mystery where my imagination takes the place of the digital TV broadcast upstairs, I can't think of a better way to while away the hours when I am not on the air. Besides, I can now brag that my shack includes a genuine R.L. Drake receiver, and with the addition of an outboard BFO, it's now a general coverage receiver.

What's ahead for me and my SW1? Probably a new antenna system. The recent article in 73 on the loop antenna has me thinking, and my tape measure measuring, to see exactly where and how large a loop I can build. Our recent unpleasantness in the form of an ice storm is still with us, and I want an antenna that will be able to withstand climatic disasters and at the same time provide me with hours of listening pleasure. I have at least half the equation, the Drake SW1 receiver — now all I need to do is improve upon my antenna.

As we were going to press, Drake announced that the SWI would be discontinued. I am told that Universal Radio still has a considerable stock, as, I would expect, do other dealers, and

Continued on page 58

Elliott S. Kanter W4PGI 1213 Pinehurst Circle SE Smyrna GA 30080-4320 [kantere@cs.com]

A BFO for Your SW Rx

With a \$10 Ten-Tec kit.

Ever since I graduated from elementary school back in the days when the air was clean and sex was dirty, shortwave listening has had a special place in my heart. My graduation gift way back then was a Zenith Transoceanic portable radio (weighed in at about 25 pounds), complete with a huge battery, earphones, and vacuum tubes.

For those of you not familiar with the term vacuum tubes, think transistors or integrated circuits, surrounded by a glass envelope and requiring awesome amounts of electricity to operate. You could tell when the receiver was on, especially at night, when its inner workings doubled as a night light, also known as the vacuum tubes glowing. But that was then, and now is obviously somewhat later. The vacuum tube has given way to a minute device called an integrated circuit, and the costly shortwave radio can be yours for as little as \$39.95 at your local mass merchandiser discount house.

Like the Internet, shortwave listening brought the world to your door. In a single day, you might hear news from dozens of countries, fine music and mysteries from the BBC in London, and even the current propaganda from what was then, and still is, Radio Moscow. Today, the listening fare is similar and even more diverse, with the opportunity to learn about other countries and maybe even a foreign language or two.

But this is a ham magazine not a travelogue, and for many of you shortwave listening is not the central point in your day. You are interested in a cheap receiver that will let you monitor a band or two, and listen for WWV time hacks and the like. Sorry. Charlie: The bulk of the inexpensive shortwave radios on the market today are AM only, and they don't receive SSB or CW signals — that is, unless you can find a way to introduce a tone using something all old receivers had, the BFO (beat frequency oscillator).

Naturally, adding this circuit has to be: (1) simple, and (2) cheap. We aren't going to take sides - real home-brewers versus appliance operators or other such feuds - but rather present a simple and cheap circuit that can be added to virtually any shortwave radio available today which does not have SSB or CW capabilities. In fact, Ten-Tec actually has available a kit of all of the parts and a predrilled, etched PC board; it sells for less than \$10 plus shipping. Without getting too technical, it's a given that most, if not all, modern radio receivers have an (IF) intermediate frequency of 455 kHz, and if we can create a "beat frequency" using a small oscillator very near this IF. we will be able to receive both SSB and CW signals.

The circuit shown in Fig. 1 uses a standard 455 kHz IF transformer and its internal capacitor to form what is called a traditional Hartley oscillator with transistor Q1 and associated parts. The oscillator relies on the center tap of the IF transformer coil; the other winding is shown as not connected and is not used. The frequency of the oscillator is varied over a wide range by turning the slug adjustment inside the IF "can." In theory, this would be a one-time adjustment and should only require changing if you are using the BFO with another receiver — if then.

The potentiometer is used to "fine tune" the oscillator during actual use, and varies the voltage applied to two ordinary silicon diodes, D1 and D2, which actually take on the role of a varactor (a voltage variable capacitor). This fine tuning function allows you to adjust the pitch of CW signals or the clarity of SSB signals. A zener diode sets the operating voltage at 6.8 volts and ensures a reasonable frequency stability during operation from voltage sources of 8–15 VDC.

Test and hookup

The best way to test your BFO is

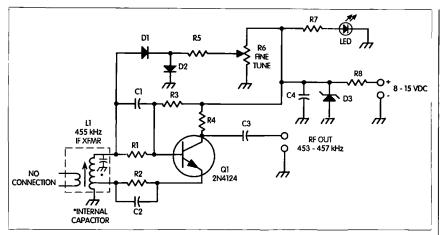


Fig. 1. BFO schematic.

by using the general coverage receiver in your transceiver, or actually using the shortwave radio that you have purchased.

- 1. Apply power to your BFO. For this test, you can use a standard 9 V battery.
- 2. Place the output wire from your BFO near the antenna connector of the receiver. If your receiver has a whip antenna, the wire may be clipped to the antenna.
- 3. Set the BFO fine tuning control to the middle position.

Part No.	Description		
R1	15k 1/8 W		
R2	470 ohm 1/8 W		
R3	22k 1/8 W		
R4	100 ohm 1/8 W		
R5	330k 1/8 W		
R6	10 pot		
R7	1k 1/8 W		
R8	220 ohm 1/8 W		
C1	47 pF		
C2, C3	100 pF		
C4.	0.1 μF		
L1	455 kHz IF transformer		
Q1	2N4124 NPN transistor		
D1, D2	1N4002 silicon diode		
D3	6.8 V zener diode		
LED1	LEO diode		

Required but not listed: DC power source, well-filtered, 8-15 V; Hookup wire or minicoax to couple BFO to receiver: Solder, soldering iron, hand tools, and alignment tool for

- 4. Tune your receiver to 455 kHz, and, using the alignment tool, adjust the slug in L1 until you hear the BFO signal. Your BFO is now ready for use with any AM-only shortwave receiver.
- 5. If you are using the BFO with your AM-only shortwave radio, tune the radio to any frequency where there will obviously be CW, RTTY, or SSB signals, then adjust the slug in L1 (refer to step 4) until you hear the background hiss, and beeps and whistles characteristic of CW/RTTY reception.

We used the Ten-Tec kit, and installed the approximately 1.5-inchsquare PC board inside a small minibox, adding an on/off switch and battery holder. Our connection to our Drake SW1 was made using the screw terminals marked as antenna connection. with our actual receiving antenna connected to the SO-239 coax connector. There is a remote possibility that you will not obtain satisfactory BFO operation by coupling the oscillator's output to the receiver's antenna. In this case, it may be necessary to try a direct connection to the receiver's 455 kHz IF section through a low value (10 pF or less) capacitor.

Considering the fact that many excellent AM-only shortwave receivers are available for less than \$50 from 73 advertisers or locally at your mall, the addition of a \$10 BFO makes them even more useful, especially for monitoring for band openings. The choice is yours: Either scrounge around, or waste gas going from here to there for the parts, or pay \$9 plus shipping to Ten-Tec for the kit. Either way, it's one heck of a value-added addition to an AM-only shortwave radio.

By the way, if you do order the Ten-Tec kit, be sure to tell them you read about it in 73 Amateur Radio Today!

A complete kit of materials, including the etched and drilled printed circuit board, is available as the T-Kit 1050 BFO from Ten-Tec Corporation, 1185 Dolly Parton Parkway, Sevierville TN 37862-3710; 1 (800) 833-7373; [www.tentec.com].

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Super-Simple 80m Fox

Build this easy and inexpensive QRP rig, perfect for dual-band foxboxes.

Are you looking for simple and inexpensive transmitters to get 80-meter foxhunting started in your area? Do you want to add 80 meters to your existing 2-meter foxboxes? Here's your answer. This rig uses one IC and one transistor, yet it puts out almost three watts of clean keyed CW with a 12-volt battery pack. It's not fussy about antenna matching and the circuit board is only a little bigger than the new "Adopt a Child" stamp.

redit for this circuit design goes to Rik Strobbe ON7YD of Baal, Belgium (**Photo A**). He calls it the ATX80. Rik has served as Interim Chair of the ARDF Working Group in IARU Region 1 (Europe and Africa), so he understands the requirements for radio foxes in international competitions. Over a dozen of these little

rigs have already been built stateside and are in regular use with no problems.

Circuit description and construction notes

Fig. 1 is the complete transmitter schematic. One gate of U1, a quad NAND IC, is the active element of the oscillator. The series-resonant crystal

is in the feedback path. Grounding pin 1 stops the oscillation, which should be done between transmissions to prevent oscillator radiation (backwave). Even with a well-shielded enclosure, the backwave can be heard about 15 feet from the transmitter, a potential giveaway to nearby foxhunters.

The remaining gates of U1, connected in parallel, form the buffer/driver stage. CW keying also takes place here. The final uses a fast-switching field-effect transistor (MOSFET) by International Rectifier Corporation that operates in Class C at about 50% duty. Components between Q1 and the antenna provide DC blocking and low-pass filtering.

Bare circuit boards are available from FAR Circuits for four dollars each, plus \$1.50 shipping for up to four. Ask for the "ATX80 transmitter." If you wish to make your own boards, artwork is available via link from my "Homing In" Web site. See **Table 1** for the parts list. Eighth-watt resistors fit best on the circuit board, but you can squeeze quarter-watters in (**Photo B**).

L1 is a miniature RF choke suitable for 80-meter blocking. Values in the 5 to 10 microhenry range are OK. Make



Photo A. Rik Strobbe ON7YD, designer of this transmitter, teaches the principles of 80-meter ARDF at the 1999 IARU Region 2 Championships in Portland, Oregon.

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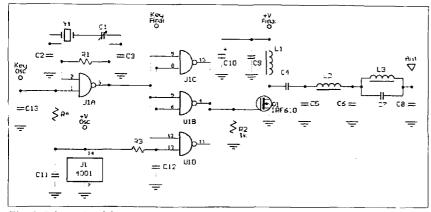


Fig. 1. Schematic of the 80-meter transmitter.

sure it can handle at least an ampere, because nearly that much will go through it if you inadvertently key the final without the oscillator running.

L2 and L3 in the output lowpass filter

P	arts List
Name	Value
C1	10-60 pF trimmer
C2, C3	150 pF
C4, C11, C15	0.1 μF
C5	330 pF
C6	1500 pF
C7	120 pF
C8	0.001 μF
C9, C12, C13	0.01 μF
C10	10 µF tantalum
C14	680 pF
D1-5	1N4148 or equiv.
Fuse	See text
L1	Rf choke, see text
12	26T, see text
L3	24T, see text
Q1	IRF610
R1	1.8M
R2	1k
R3, R4	15k
R5	680k
R6, R7	56k
R8	330k
U1	CD4001B
U2	CD4049B
Y1	Crystal, see text

Table 1. Parts list.

are wound with AWG #24 enameled wire on Amidon T50-6 (1/2-inch O.D. yellow) iron powder toroidal cores. Space the turns evenly around the circumference of the core. These coils stand vertically on the board and should be fastened down to prevent damage from shock and vibration. I used "hot glue."

The rest of the parts are available at Digi-Key and many local electronics parts houses. Parts for live transmitters should cost about fifty dollars. You'll spend less if you have a well-stocked junk box (Photo C).

Like most 80m ARDF promoters, I chose 3579.5 kHz for my course foxes. TV colorburst crystals for that frequency are plentiful and inexpensive. The board is laid out for crystals with 3/16-inch lead spacing. I used junk box crystals in much larger holders by bending the leads and drilling out the holes slightly so that they fit.

Rik says that you can use a ceramic resonator (such as 2TA-3.58MG by ECS International, available from Digi-Key) in place of the crystal. With the resonator, the frequency can be tuned from about 3579 to 3630 kHz with C1. The downside of using a resonator is that frequency stability is not as good. You may have to experiment with lower values of C3 and use NPO capacitors at C2 and C3 to prevent drifting as Q1 warms up the circuit.

With a crystal, I found the transmitter is "stable as a rock" and adjusting C1 has little effect. I replaced that trimmer with a 47 picofarad fixed capacitor.

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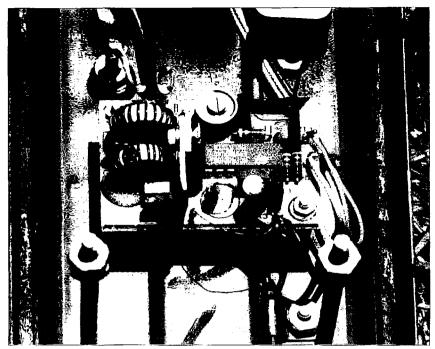


Photo B. A 2 x 1-3/8 inch circuit board holds all components for the QRP transmitter.

frequency at least 20 kHz away from the course foxes. A 3546.8 kHz crystal is 99 cents in the B.G. Micro catalog. That supplier also has 3-packs of colorburst crystals for a dollar per pack. North American 80m foxtailing events are in daylight, when there's no distant propagation and the band is quiet. Nevertheless, take care to avoid any local daytime net frequencies.

You'll need a heatsink at Q1, even though there isn't much room for it. I trimmed the sides from Aavid 593002B03400 sinks to get flat 1- x 1-1/8-inch anodized pieces with suitable bolt holes. Putting tape on one edge

prevents shorts to leads of C4 and C5. Thermal grease under the transistor insures best heat transfer to the sink. Hot glue holds the sink in place on the board to keep transistor leads from getting bent.

Keying and timing

The Montreal Fox Controller (MFC) by François Tremblay VE2JX and Jacques Brodeur VE2EMM is ideal for keying and timing of this transmitter in a foxbox. Use the 80-meter (CW) MFC output to key the final and the two-meter PTT (TX ON) output to key

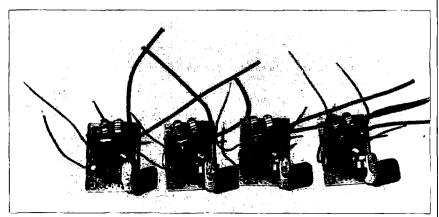


Photo C. Four assembled transmitters with output coax attached, ready for installation in foxboxes.

the oscillator. The audio tone output (MCW/2M) is not used on 80 meters. If you use the MFC, you don't need the interface circuit of **Fig. 2**.

Plans for the MFC are in 73 Magazine's "Homing In" column for April 1998. Updates and links are at my Web site (URL at beginning of this article). I recommend the revised MFC firmware by Charles Scharlau NZØI, which incorporates a short delay between PTT and CW keying. This prevents the high current pulse that occurs with the original firmware at the start of each transmission.

The PicCon by Byonics (Byon Garrabrant N6BG) is also a suitable controller for this transmitter. It has only one keying output, which is selected by DTMF command to be either CW or PTT. To have separate keying of oscillator and final, a simple hardware modification is necessary. I came up with this mod and the interface circuit of Fig. 2 so I could use PicCons to control both 80m and 2m transmitters in five of my foxboxes (Photo D). Either or both bands will transmit at the programmed times, determined by the settings of S1 and S2.

The PicCon mod is simple: Isolate the extra grounded pad of the 6-wire connector on the board (the pad closest to the corner). I carefully used a Dremel tool with a #192 cutter bit. Now, connect a wire from the newly isolated pad to pin 6 of the 16F84 PIC socket. (Yes, it's pin 6 and not pin 7. There is an error on the schematic in the version 1.0 PicCon manual.)

This mod brings out the audio square wave on the blue cable wire (pin 6 of the RJ11 connector) at a level sufficient to drive logic gates. Use the black wire (connector pin 2) for both "radio ground" and "DC ground." Command the ID Tone for about 800 Hz (B375). Do not set the PicCon for CW Mode (B502).

In Fig. 2, U2 and associated components detect the envelope of the audio tone, which is buffered and becomes the CW keying line to the final stage of the transmitter. DC isolation with C14 is important because the resting state of the PicCon tone output can be either logic HIGH or LOW. D4 and its

connection to U2-14 keep the final from being keyed if the oscillator is not on.

I built my interfaces on 1-3/8-inch-square pieces of perfboard. Components inside the dashed lines in **Fig. 2** are part of the keying circuit of my existing two-meter transmitters. The diode across the relay coil is important to prevent inductive "kick" from damaging D3 and U2 when the relay opens. If your transmitter uses relay keying and doesn't have this diode, add it.

U2A and U2B provide logic HIGH output that follows the CW keying. I use it to drive the LM317 voltage regulator control terminal in my twometer transmitter through a resistor of about 47k ohms. This provides about 50% keyed amplitude modulation in addition to the MCW FM. It's very helpful to users of foreign-made twometer AM RDF sets with audio strength indication, such as the Ron Graham (Australian) and Altai (Russian) units. See "Homing In" in the March and June 1998 issues of 73 Magazine for more details of my 2m foxboxes. If you don't use those two gates, be sure to ground the inputs (pins 3 and 5). Leaving them open would cause high supply current.

Build it tough

Foxboxes take a lot of abuse, so make yours as rugged as possible. Like most ARDF course-setters, I prefer surplus ammunition boxes for enclosures because they are inexpensive and waterproof. By mounting all the electronics (except battery) on the lid and securing all cables, there is no worry about wires and coaxes flexing and breaking just before a hunt.

Photo E shows how I constructed my finish-line beacon. Note the clamp that holds battery wires to the lid. This prevents them from breaking at the connection to the transmitter board. RF output to the antenna wire goes through the lid on a Pomona #3760-2 insulated binding post. Radial wires connect to a grounding bolt and wing nut on the outside of the lid.

The BNC feedthrough in **Photo E** is left over from previous use of that

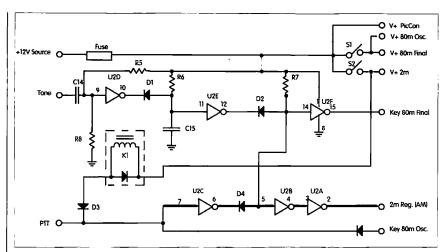


Fig. 2. Schematic of the interface between 80m transmitter and PicCon controller. It also shows the 12-volt power distribution for the dual-band foxbox.

ammo box on two meters. Someday I may use it for a remote control antenna. When fully assembled, a cover plate is held in place by the five long bolts. The heavy battery in the box bottom is cushioned by foam, but the cover over the transmitter and MFC provides physical protection to them in case the battery shifts in transit.

The fuse in Fig. 2 prevents battery meltdown if an accidental short occurs.

Value should be about double the maximum transmit current of all transmitters in the foxbox. Two amperes should be about right to start. Since fuseholders can become intermittent, I prefer to solder in about an inch of fine magnet wire (AWG 32) instead of using an ordinary 3AG fuse and holder.

Why the concern about intermittents? Both PicCon and MFC have delay-start timers so that you can put

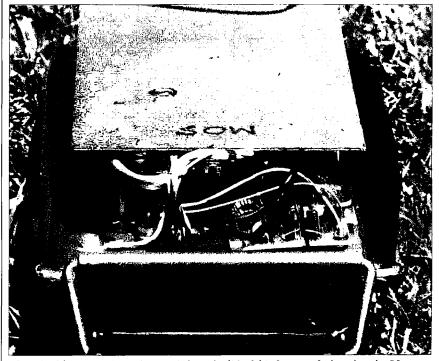


Photo D. There wasn't much room left on the lid of this 2-meter foxbox, but the 80-meter board fit right in. The edge of the PicCon with reset button and LED indicator is visible on the underside of the protective plate.

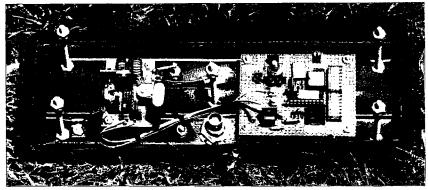


Photo E. The ATX80 transmitter (left), Montreal Fox Controller (right) and a battery (not shown) are all you need for an effective 80-meter ARDF transmitter. They all mount in the cover of a small ammunition box.

your foxboxes out on the course several hours ahead and have them start in proper sequence just as the hunt begins. If power to these controllers is interrupted for only a few milliseconds during the countdown, they will reset and there will be dreaded silence at start time.

Slide switches in my projects have developed intermittents in the past, so I use toggle switches or soldered wires instead. All switches should be mounted completely inside the foxbox to prevent accidental activation or deactivation in transit. Check battery connectors regularly and re-crimp as needed to prevent another cause of intermittents.

Components in Fig. 2 were largely determined by the contents of my junk box, which includes lots of CMOS ICs. Bipolar logic with open-collector

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outputs would have made for a more elegant design, eliminating D1, D2, and D4 at the expense of higher supply current during countdown. Let your own parts sources be your guide.

Will it smoke?

My preferred method of initial checkout for projects like this is to apply power and verify critical IC and transistor node voltages before these devices are installed. (That's after doing a careful visual inspection of all other parts, of course. I found a solder bridge on one board that way.) I prefer sockets for ICs, but there wasn't room on this board.

For foxbox service, use a 12-volt lead-acid or nickel-cadmium battery pack. At typical 12.5 V pack voltage. I measured 3.1 watts RF into a 50-ohm dummy load. This is at the low end of the IARU requirements for championships (3 to 5 watts), but has been more than adequate for southern California foxhunts. Under these conditions, total current drain of all stages was about 400 milliamperes. Second harmonic was -36 dB relative to the fundamental, and third harmonic was -52 dB. All other harmonics and spurs were -64 dB or better. These values meet the FCC requirements in 97.307(c).

For more RF output, you can increase the final stage supply voltage. At the extreme, Rik got 19 watts out of his rig with a 30-volt supply, using a much larger heat sink on Q1. Do not exceed +15 volts to the oscillator and buffer stages. The circuit board

has separate voltage source pads for oscillator and final.

There are no antenna tuning and matching adjustments, but this transmitter is very tolerant of nonmatched loads. You can get an idea of the closeness of match by measuring the final DC current. I sometimes get only 300 mA or so when using a random vertical antenna (see "Homing In" elsewhere in this issue), but so far the foxhunters have always heard the signal at the start point, which may be three or more kilometers away.

Many thanks to Rik Strobbe ON7YD for providing this design to radio-orienteers. Thanks also to Bob Frey WA6EZV, who arranged for the stateside circuit board source. I'm eager to hear of your experiences with this little transmitter. You can send Email or postal mail to the address at the head of this article.

Resources

Amidon Associates, Inc. 240 Briggs Avenue Costa Mesa CA 92626 (714) 850-4660 [http://www.amidoncorp.com]

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YOU Can Build the FoxFinder 80!

Here's how to get started in the exciting world of 3.5 MHz ARDF.

The purpose of this article is to describe how to build a simple amateur radio direction finding (ARDF) receiver for 80 meter international-style transmitter hunting. The criteria for the receiver is that it must be easy to align without expensive lab equipment, and all the parts must be easy to locate. In the case of this receiver, the majority of the parts were purchased from Digi-Key, Newark, Radio Shack, and Radio Shack Unlimited. One component was purchased from Amidon Associates, and another part was located at a local surplus store (10-turn knob pot used for VFO control).

Inlike for VHF direction finding (DF) equipment, very little information about complete 80 meter DF sets can be found in the United States. Bits and pieces of information relating to DF antennas can be found in books such as the current edition of the ARRL Antenna Handbook. Another source of information is a book by Joe Moell KØOV titled Transmitter Hunting: Radio Direction Simplified. Also, a new book by Joe Carr is a good source of information

about loop antennas; its title is Joe Carr's Loop Antenna Handbook.

Information on small CW receivers can be found in the ARRL Handbook, ORP handbooks and the Internet.

Back in May of 1999, I started developing my first portable receiver for use in the ARDF competition of the Tenth Anniversary Friendship Radiosports Games in Portland OR, in August 1999. The result was an operational receiver that was used there. I was the only US contestant with my

own 80-meter equipment. All other US contestants used equipment provided by the Europeans.

The receiver described in this paper is my second-generation design. My first version receiver shown in **Photo** A was the one that was used in the Portland event. It was a superhet with an 8 MHz IF and a ferrite rod antenna with a vertical sense whip (more on why a sense antenna is required later). Several improvements were made based on my experience using the original

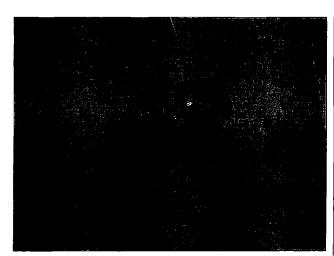


Photo A. Receiver used in 1999 Portland games by Jerry Boyd WB8WFK.

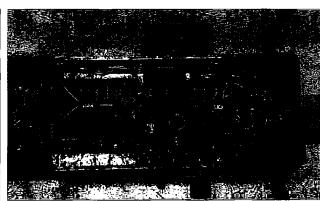


Photo B. Inside view of the receiver. After gluing the loop in place, coils L1 and L2 are wound. First, coil L1 is wound using 6 turns of #28 wirewrap wire. The wire ends are connected to the bulkhead (see Fig. 5). Next, sense-coupling coil L2 is wound using 5 turns of wirewrap wire.

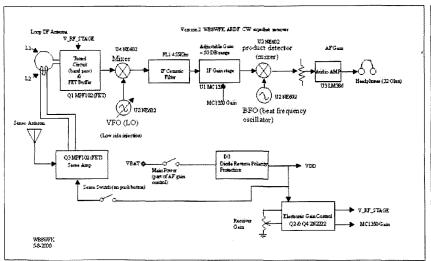


Fig. 1. HF DF receiver block diagram.

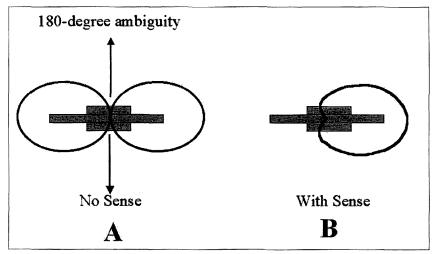


Fig. 2. Loop antenna patterns, viewed from above looking down onto receiver. A. No sense. B. With sense.

hope that this receiver will inspire the | built HF DF sets in the United States.

receiver during the 1999 hunt. It is my | beginning of experimenting with home-



Photo C. Another view showing how sense antenna and loop are attached.

To improve the receiver, size and weight reduction efforts were undertaken. The first generation receiver was awkward to carry, and I decided that the next receiver must be as small and light as possible. After all, an ARDF course can be up to 8 km in length, and weight becomes important. A plastic case was used for both receivers. To provide shielding, the inside is lined with copper foil.

Next, cost reduction efforts were used for the second-generation receiver, including the design of the loop. This would make it more affordable to reproduce. The \$15 ferrite rod used in the first receiver was replaced with a loop wound inside 1/4-inch copper tubing using wirewrap wire.

Also the IF frequency was changed from 8 MHz to 455 kHz so that low-cost

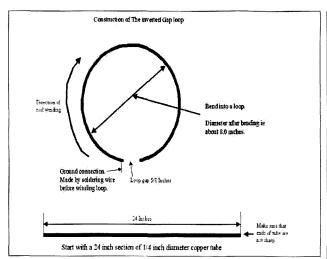


Fig. 3. Faraday shield construction.

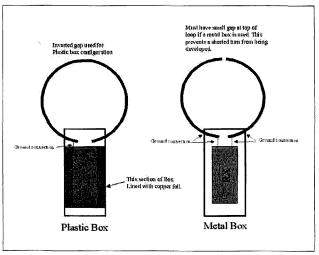


Fig. 4. Diagrams showing the use of a plastic box or a metal box.

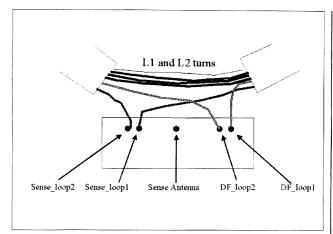


Fig. 5. Bulkhead connections, as viewed from receiver PCB.

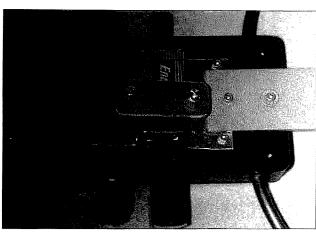


Photo D. Home-made battery holder.

AM radio IF filters from Digi-Key (or surplus sources) could be used. The 8 MHz version used a homemade crystal filter in the IF made from microprocessor crystals and required a crystal selection process. I thought that this would not be easy to reproduce without test equipment to verify its operation. The improved receiver has a "no-tune IF."

Another improvement was the addition of electronic switching for the sense antenna. This appears to be a common feature in European designs. This allows the sense enable switch to be located in a location that is easy to operate with one hand. A normally open push-button switch is used for the sense switch. The receiver is powered by a 9 volt battery.

Block diagram and receiver operation

Refer to Fig. 1 for an overview of

the receiver. The signal is first picked up by L1, the primary DF antenna (L2, the sense-coupling loop, will be discussed later). L1 and L2 are housed in a Faraday shield made from 1/4-inch copper tubing. L1 presents the typical figure-eight pattern (refer to Fig. 2A) The voltage induced into the DF loop is amplified by Q1 FET amplifier. Adjusting the drain voltage controls the gain of Q1. The electronic gain control circuit Q2 accomplishes this. The gain control operation is nonlinear.

Following amplification by Q1, the signal is passed on to U4 a Phillips NE602 (or SA602). U4 is configured as a Gilbert cell mixer and varactor diode—tuned VFO. The VFO is operating 455 kHz below the desired received signal (referred to as low side injection). The data sheet specifies a conversion gain of 14 dB at 45 MHz. No

graph was provided to determine the value at HF.

After conversion to the IF frequency the signal is filtered by FL1 to remove undesired signals. FL1 has a 6 dB bandwidth of 4 kHz. U1 is an IF amplifier with adjustable gain control. The data sheet specifies a gain of 50 dB (at 45 MHz) and a gain control range of 60 dB (at 45 MHz). Adjusting the AGC voltage controls the gain of U1. The electronic gain control circuit Q2 & Q4 accomplish this. Following amplification by U1 the signal is converted to base band (audio) by product detector U2 and BFO U2. A low cost ceramic resonator determines the BFO frequency. U2 is also a Phillips NE602 (or SA602).

After conversion to base band, the signal is amplified to a level to drive a stereo headphone by U3. U3 is a



Photo E. Author's daughter, Megan, finds null without sense.



Photo F. Megan activates sense and notes that the signal nulls.

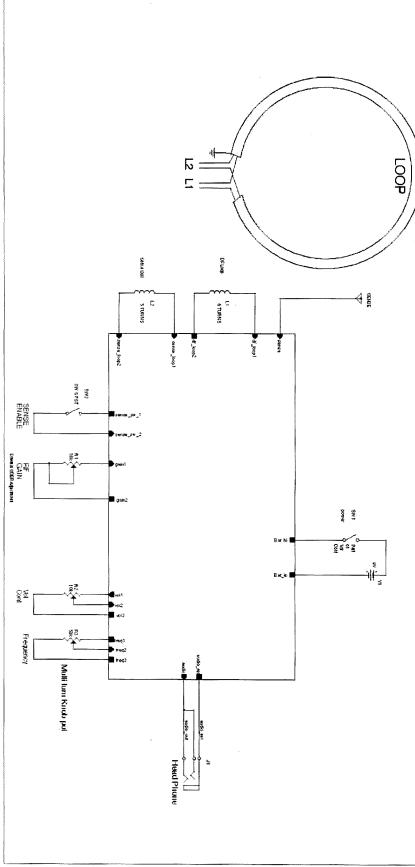


Fig. 6. Top level schematic.

National Semiconductor LM386 configured for a gain of about 50 (set by 1 μ F ceramic capacitor C7). The headphones can be any set that has Z of 32 ohms. A quick note about using cheap headsets: They may have lower efficiency than name brands. I can notice the difference between a Sony set versus a \$5 no-name. However, the \$5 version works.

Electronic gain control Q2 and Q4 provides manual gain control of the receiver. Manual control is desired for a DF receiver, because automatic AGC action would adjust the gain of the receiver as the loop is turned. This could make finding the null difficult because of AGC trying to maintain a constant volume level.

Because the loop provides a figureeight pattern, two nulls would occur. Thus a 180-degree ambiguity exists. The nulls are perpendicular to the loop axis (Fig. 2A). The sense antenna and sense amplifier is used to modify the pattern of the loop to allow solving the ambiguity. When the sense switch is closed, VCC is applied to the drain of Q3, amplifying any voltage induced into the sense antenna. The amplified signal is summed, with the signal being received by the DF loop through coupling loop L2. A cardioid pattern (Fig. 2B) results, thus producing one null and a peak.

Faraday shield construction

Refer to Fig. 3. To form the Faraday shield, start by cutting a 24-inch section of 1/4-inch copper tubing. After cutting the tubing, it is very important to remove any sharp edges on the ends. This will prevent damage to the coils during and after winding (sandpaper was used for this operation). Next, bend the loop as shown in Fig. 3.

Attaching Faraday shield to box

Next, we attach the loop to the box after bending the loop. My version used a plastic box, so I used the inverted gap configuration described in Fig. 4 (left side). If a metal box is used, it's very important to use the configuration shown on the right-hand side of Fig. 4. The reason for doing this is to prevent the Faraday shield

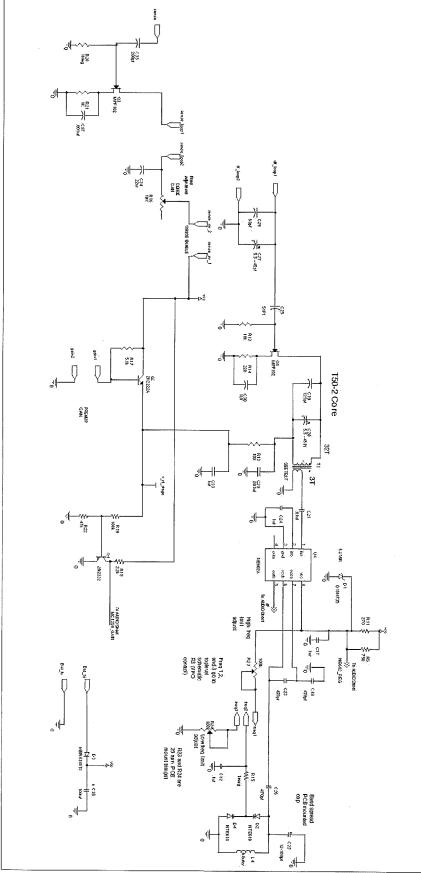


Fig. 7. Receiver schematic.

from forming a shorted turn. If the inverted gap configuration is used with a metal box, the receiver will not work. Also, if a plastic box is used, you need to provide some shielding for the receiver board. Do not extend the shielding above the position shown. This shielding is connected to the receiver circuit board ground.

After gluing the loop in place, coils L1 and L2 are wound. First, coil L1 is wound using 6 turns of #28 wirewrap

	Parts List A										
Qty.	Name	Value	Note								
3	C1; C13, C36	100 μF	RS 270-1028								
7	C2, C3, C4, C9, C17, C24, C32	0,1 μF	Ceramic from junk box (JB)								
2	C5, C6	500 pF	Silver mica JB								
4	C7, C10, C30, C33	1 µF	Ceramic JB								
4	C8, C11, C15, C21	0.01 μF	RS								
1	C12	10 μF	RS								
1	C14	220 µF	RS 272-956								
1	C16	0.1 μF	RS								
3	C18, C23, C26	470 pF	Silver mica JB								
1	C19	125 pF	Silver mica JB								
2	C27, C20	5.5-45 pF	Newark 9304								
1:	C22	12–100 pF	Newark 9328								
1	C25	51 pF	Silver mica JB								
2	C28, C37	0.001 μF	RS								
j.	C29	68 pF	Silver mica JB								
1	C31	100 pF	Silver mica JB								
1	C34	0.22 μF	Ceramic JB								
ां.	C35	200 pF	Silver mica JB								
1	D1	1N4735	6.2 V RS 276- 561A								
1 per	D2	MV104	Newark MV104								
7	D3	MBR\$140T3	Newark MBRS140T3								
1	FL1	TK2330	Digi-Key TK2330-ND								
1	J1	Stereo phone jack	RS								
1	L1	6T #28	See text								
1	L2	5T #28	See text								
1	L3	150 µH	Digi-Key DN41154-ND								
1	L4	6.8 µH	Digi-Key M8023-ND								

Table 1. Parts list.

wire. The wire ends are connected to the bulkhead (see Photo B and Fig. 5). Next, the sense-coupling coil L2 is wound using 5 turns of wirewrap wire.

The sense antenna is made from a 20-inch section of 3/32 bronze rod purchased from a local welding supply store. The sense antenna is attached to the bulkhead and hot-glued in place. Next, connections from the bulkhead to the main board are made for the sense antenna, L1 and L2. For safety

Parts List B										
Qty.	Name	Value	Note							
2	Q1, Q3	MPF102	RS 276-2062							
2	Q2, Q4	2N2222A (MPS2222A)	RS 276-2009							
1	R1	50k pot	Small JB							
1	R3	50k (use 51k fixed R) 10- turn knob pot	Surplus							
2	R8, R13	10k 1/4 W	RS							
1	R16	10k PGB pot	RS 271-282							
1	R4	22Ω 1/2 W	RS							
1	R5	750Ω 1/4 W	JВ							
1	R6	470Ω 1/4 W	JВ							
2	R7, R10	10Ω 1/2 W	RS							
1	R9	1.5k 1/4 W	RS							
1	R11	270Ω 1/4 W	RS							
1	R12	100Ω 1/4 W	RS							
1	R14	220Ω 1/4 W	RS							
2	R15, R20	1 meg 1/4 W	RS							
1	R17	5.1k 1/4 W	JB							
1	R18	2.2k 1/4 W	RS							
1	R19	100k 1/4 W	RS							
1	R21	1k 1/4 W	RS							
1	R22	47k 1/4 W	RS							
1,	SW1 & R2 power	Volume control	RS 271-215B							
1 (SW2	SPST	JB or check RS							
4	T1	T50-2 core	Amidon. Wind with #28 wirewrap wire, 32T PRI/3T SEC							
1	U1	MC1350	NTE745 or ECG745, purchase at any TV parts store							
1	U2; U4	NE602A	RS Unlimited RSU 11928173							
1	ÚЗ	'LM386'	RS 276-1731							
1	X1	455 kHz	Digi-Key, TK9942-ND							
Y.	Box	8 x 3 x 1	RS 270-1808							

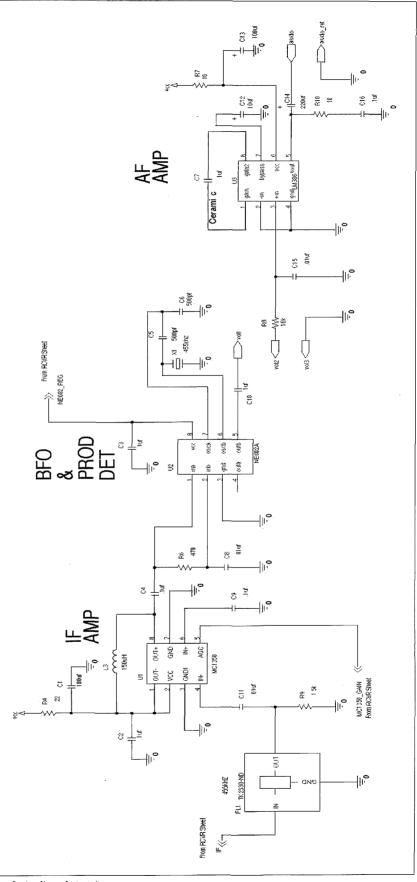


Fig. 8. Audio schematic.

purposes, a small round wood or plastic ball (painted red or orange) should be attached to the end of the sense antenna for eye protection. **Photo C** shows how the two antennas are attached.

Assemble and install the receiver board after the loop is constructed. Refer to **Photo B** for approximate location of active stages. Be sure to use good high frequency wiring practices and keep leads as short as possible. Note that T1 is also wound using number 28 wirewrap wire. The primary is 32 turns and the secondary is 3 turns.

Alignment testing and operation; location of adjustments (see Photo B)

All adjustments and test points will be found in **Fig. 7**, the receiver schematic. Before starting, preset the controls to the following conditions:

- 1. Set the VFO control for center scale (if the knob pot is used, it's 5 on the dial).
- 2. Adjust the RF gain control for maximum RF gain.
- 3. Set the volume control for a low audio level.
- 4. Using a voltmeter, adjust the sense gain control (R16) for maximum voltage at the drain of Q3.
- 5. Note the next steps will temporarily allow the receiver to tune a very wide range (about 1 MHz) for alignment purpose only. This will make VFO tuning very fast, but it's only a temporary condition. After the receiver alignment procedure is completed the VFO tuning range will be 3480 to 3800 kHz.
- 6. Using a voltmeter connected to FREQ 3, adjust R24 for zero volts.
- 7. Using a voltmeter connected to FREQ 1, adjust R23 for maximum voltage.

Note: Use a plastic alignment tool when adjusting the variable capacitors. This is most important for C22, the VFO frequency adjust.

Next, you will need a signal source set to 3579.5 kHz. Couple to the loop by placing a small loop connected to the signal source near the receiver DF loop.

The process for adjusting the bandspread capacitor and peaking the front end is as follows:

- 1. First, set the VFO so the receiver receives 3579.5 kHz. This is accomplished by adjusting C22 until you hear the signal.
- 2. Next use a communications receiver set to 3124.5 kHz to hear the LO. Use a probe made out of wire as the antenna located close to the NE602. This will verify that an image is not being received and that the VFO is on the correct frequency.
- 3. Align the front end by adjusting C27 and C20 for maximum signal and listening to the signal as each adjustment is tuned. As necessary, reduce the signal generator amplitude.

To set the VFO tuning range:

- 1. Set the signal source to 3800 kHz, tune the receiver to hear the signal, and measure the voltage at the arm of the VFO pot. Write down this voltage as V high.
- 2. Set the signal source to 3480 kHz. Tune in the signal and also measure the tuning voltage. Mark it down as V
- 3. The next steps will have to be repeated about 6 times because the adjustments interact.
- 4. Connect voltmeter to FREQ 3 and adjust R24 for V low.
- 5. Connect voltmeter to FREQ 1 and adjust R23 for V high.
- 6. Repeat until the two measurements equal V high and V low.
- 7. Your receiver will now tune from 3480 to 3800 kHz. This tuning range is outside the bandwidth of the front end. However, this range was chosen to allow the receiver to be operated during a low battery condition when the voltage regulators are out of regulation. Drift during normal operation is small. Large drift indicates a battery near the end of its life. You can pick a narrower range by finding a new V high and V low. Just use the new V high and V low in steps 4–5. The battery is mounted externally, as shown in **Photo D**.

After the receiver is working, the sense amplifier gain is adjusted. I used my 80 meter QRP ARDF transmitter. It's important to use a local source. Do not attempt to adjust the sense circuit using a long distance signal that is arriving via skywave. According to the ARRL Handbook, it is possible to get poor (or no) nulls on a signal that is via

skywave (page 14-5, ARRL Antenna Handbook, 18th edition). I aligned the sense antenna system at a distance of about 500 feet from the transmitter. So far, testing indicates that the sense antenna works over the useful range of the receiver. The only thing I noticed is that the sense antenna does not produce a null or peak at a distance less than about 15 feet from the transmitter. However, the loop still produced nulls. In a real ARDF event you can see the markers at a distance where the sense is still working.

To adjust the sense antenna, perform the following sequence:

- 1. At a distance of about 500 feet (minimum) from the transmitter, rotate the receiver and find the null. Now rotate the receiver 90 degrees from the null (for now, any direction). Push the sense switch and rotate R16 through its range. If you are in the right quadrant, you will find a place in the adjustment range of R16 where the signal will dip. If you continue adjusting R16, the signal will pass the dip and increase in strength. If you don't find the dip, rotate 90 degrees in the opposite direction from the null. You should find it. Adjust R16 for a dip in signal strength. Mark the side of the loop pointing toward the transmitter (where the dip occurred) with tape.
- 2. Test the operation of the sense by finding the null. Knowing the direction of the transmitter, rotate the loop 90 degrees (use the end that is not marked with the tape). Push the sense switch. The signal should increase.
- 3. Go back to the null (without the sense switch pushed), and rotate the loop (end marked with tape) 90 degrees toward the transmitter. Push the sense switch. The signal should dip.
- 4. Another simple test is to hold in the sense switch while rotating the receiver. The signal should dip when the end marked with tape is pointing toward the transmitter (the dip is 90 degrees offset from the null obtained with no sense). The signal should peak when the end of the loop with no tape is pointed at the transmitter.

Operation (refer to Photo E)

Safety first! Always watch out for

power lines and where the sense antenna is pointed.

First, find the null without the sense antenna active. After the null is found. rotate the receiver 90 degrees from the null and activate the sense (Photo F). Note the strength of the signal before and after activating the sense. If the signal dips or slightly decreases, the taped end of the loop is pointing toward the transmitter. If the signal increases, the nontaped end of the loop is pointing toward the signal. After the 180 degree ambiguity is solved, deactivate the sense and use the null without sense. That null is usually deeper.

Closing comments

Dale Hunt WB6BYU suggested that it may be possible to replace T1 with a modified 10.7 MHz IF transformer. If anyone tries that, please let me know. I am currently working on having a professional board layout done. I plan to use a footprint for T1 that would allow a standard 10.7 IF transformer to be substituted. Dale also suggested that the VFO coil could be replaced by an adjustable inductor, and that could eliminate the need for a variable capacitor for C22. For field-testing, I am currently using a 0.15 watt CW transmitter that was designed for ARDF use. The plans for it, as well as information concerning the availablility of PCBs, can be found on my Web site.

Acknowledgments

I would like to thank the following people for assisting with this project: my wife Gail, for putting up with the long hours that can occur when undertaking something like this; my sister-in-law, Toni, for reviewing the text; Dale Hunt WB6BYU, for reviewing schematics and making suggestions (Dale also provided information about European receivers); and Mike Pendley K5ATM, for digital image processing.

Additional references

My Web site (Albuquerque transmitter hunters) is at [http://home.att.net/ ~wb8wfk]. The Homing In Web site is at [http://members.aol.com/homingin/ index.html].

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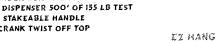
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80m ARDF Comes to America

If your club holds only 2m ARDF events, you're missing half the fun. There's another international foxhunting band, too.

Before 2m FM took off in the late 1960s, clubs held their mobile hidden transmitter hunts (T-hunts) on the 80m and 10m bands. Look through ham radio magazines of the 1950s, and you'll see a variety of radio direction finding (RDF) antennas sticking out of car windows, including big box-shaped loops and little ferrite rods.

Transmitters and receivers used tubes back then, so "portable" really meant "big and heavy with a handle." Low-voltage dry cells were necessary to light tube filaments, and high-voltage batteries powered the tube plates. That didn't stop the ham hiders of that era, who sometimes put their emitters in baby carriages and built them into fake fire hydrants, just like today.

Skywave propagation makes eighty meters a crowded place after dark, so

foxhunts on that band were daytime events. (At night, ten meters was preferred.) The winner was usually first vehicle to be spotted by the hider, so hand-held "sniffers" were unnecessary.

Almost a half century later, hams on this continent are rediscovering the joys of short-wave-band RDF. That's because it's an important part of the international on-foot foxhunting scene. Today's solid-state technology makes it easier and much more fun.

Europe leads the way

As regular "Homing In" readers know, competitive on-foot foxhunting (also called foxtailing, radio-orienteering, FoxOring and ARDF) follows rules that are promulgated by the International Amateur Radio Union

(IARU). They originated in eastern Europe, where the sport began on 80 meters in the 1970s (**Photo A**). Two meters was added later. Nowadays, IARU's national, regional, and world ARDF Championships have an 80m event on one day and a 2m event on another.

In a few countries such as Sweden, 80 meters is still the primary band for ham radio transmitter hunts. A few years ago, I interviewed Per-Axel Nordwaeger SMØBGU, who put out courses for the 1994 ARDF World Championships near Stockholm. P-A dislikes the signal reflections that plague VHF hunts. "I don't find 2 meters as interesting because it's so unpredictable," he says. "You end up in many places other than where the transmitter really is."

Stockholm foxhunts are Wednesday evening at 7 p.m. in large wooded forests. In most months, that's well after sunset. Snow-covered courses are frequent. The hider puts out seven transmitters, timed to come on automatically and to transmit one after another in sequence.

"Our old-fashioned receivers interfered with each other," says P-A. "So we had to spread the hunters out. They scatter into the forest two minutes before the first fox starts. They are allowed to continue to search for two minutes after the last transmitter shuts off, then return to the start. About an hour after the hunt ends, the foxes automatically start transmitting again to help the organizer find them to pick them up."

According to SMØBGU, most Swedish radio-orienteers use the same receiver design, which is about the size of a cigarette pack (**Photo B**). "Two Swedes started building them around 1965," he says. "The circuit has been improved over the years. We can buy them either complete or in parts. The ferrite loop is quite OK. My friend Lars Nordgren SMØOY uses a larger air-core



Photo A. In the early days of ARDF in Europe, fox transmitters were just like the ones used in USA T-hunts of the 1950s — big, bulky, and keyed by hand.

loop instead. It is heavier to carry, but gets a sharper bearing null"

Stateside foxhunters know that 2-meter RDF is made more difficult by multipath. VHF signals reflect from buildings, hills, and mountains. Bearings are most accurate when transmitters and receivers are line-ofsight and there are no large terrain features nearby. When you're in a canyon on the back side of a hill, 2-meter signals are weak, and bearings aren't trustworthy.

Eighty meters is a different story. Groundwave is the primary propagation mode for fox signals on that band in davtime. Long metal structures such as power lines and fences can affect bearings if they are close to the receiver. But in general, bearings are sharper and more consistent than on VHF. Eighty-meter RDF equipment is smaller and lighter, too. That explains why winning times on 80m were two to 16 minutes better than for the same age/gender divisions on two meters in the 1998 ARDF World Championships.

Ewald Stadler DJ2UE of Herrenberg. Germany, is a foxhunt organizer and trainer for the Deutscher Amateur Radio Club. He says, "On 80 meters, you have to know your equipment, the null and front-to-back ratio. But mostly it's running, a sport competition. However, on two meters, it's a brain competition. You have to be very careful what you do because of the signal reflections. On 80 meters, you can stand still and navigate and take your bearing and then go, but on two meters, no way! If you stand still and take a bearing, you may be off by 30 degrees."

ARDF promoters around the USA are adding 80 meters to their events. Starting in March, all of our southern California multifox practice/demonstration sessions have had at least one 80m transmitter. Usually the hunters find the 2m foxes first, then start over again on eighty using borrowed gear. Most of them express amazement at the sharp, bounce-free bearings on the new band.

Sharp bearings and small lightweight RDF gear make 80m an ideal band for introducing youngsters, particularly pre-teens, to amateur radio and ARDF. Would this be a great activity for your next Scout campout or Jamboree-on-the-Air?

Getting bearings on 80m

Several manufacturers make "longwaveto-microwave" multimode hand-held receivers and scanners covering the 80m band. Available models include the Icom IC-R10. Yaesu VR-500, Alinco DJ-X10T, and AOR AR8200IIB. With such a set and an RDF antenna, you're ready for an 80-meter hunt (**Photo C**). Be sure that the receiver has CW or SSB modes in addition to FM, because 80m foxes send keyed CW.

On two meters, you can get a rough bearing by simply holding your handie-talkie or scanner close to your chest and turning around, listening for the signal null that indicates that the source is behind you. This "body shield" technique won't work with an 80m handheld, because these long-wavelength signals pass right through our bodies with almost no attenuation.

Reflectors or shields of metal won't make your 80m set reliably directional either. Attempts to shrink 80m yagis, quads and other high-gain antennas to portable size have proven futile. So loop and rod antennas are the best way to get good 80m bearings, just as they were almost a half-century ago.

Large, multiturn box-frame loops are accurate and sensitive for mobile use (see "Homing In" for August 1991). However, they're too big and clumsy to carry on foot. Winding about the same amount of wire on a small ferrite rod makes for a light easyto-carry antenna that has the same sharp nulls and almost the same sensitivity. Small air-core loops can also be effective if care is taken to achieve good electrical balance.

Adding a vertical "sense" whip or wire with proper signal phase resolves the rod or loop's inherent 180-degree ambiguity. More about the theory and practice of HF loops, rods, and sense circuits is in the ARRL Handbook and my RDF book. (Transmitter Hunting - Radio Direction Finding Simplified by Moell and Curlee is published by TAB/McGraw-Hill, ISBN number 007-1560068.)

Champion 80m ARDFers of Europe and Asia prefer integrated receiver/antenna sets. Each country seems to have its only favorite design. A set by Siegfried Pomplun DL3BBX is popular in Germany and the Netherlands (Photo D). You can buy a kit version for about US\$95, if you're willing to arrange for currency exchange. There is a Web link at the "Homing In" site with more information.

Altai ARDF sets from the Barnaul Radio Factory in southwestern Siberia are used throughout the former Soviet Union. That factory makes the "Altai-3.5" for eighty meters, which has a tunable receiver and loop/spike directional antenna system (Photo E). The loop is about one foot in diameter.

The USA doesn't have a favorite 80m receiver/antenna set yet, but Jerry Boyd WB8WFK of Albuquerque (Photo F) is working hard to create one. See his article, "YOU Can Build the FoxFinder 80!", elsewhere in this issue of 73.

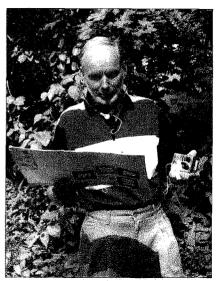


Photo B. Per-Axel Nordwaeger SMØBGU is ready for the next Stockholm hunt in the forest. Note his cigarette-pack-size receiver with rod and sense antennas.

International rules for 80m ARDF call for transmitters to have 3 to 5 watts output, keyed CW. Frequency range is 3500 to 3600 kHz. A General class or higher license is required for the hider above 3525 kHz and Extra below 3525 kHz. There's no license requirement for the foxhunters, of course.

The most popular 80m fox frequency is 3579.5 kHz, because inexpensive TV



Photo C. Bob Legg W6QYY built this 80meter RDF antenna to use on foot with his MF/HF/VHF multimode hand-held scanner at a recent southern California hunt.



Photo D. Try it, you'll like it! Matthew Cook gave high marks to 80m ARDF after experiencing it for the first time at Caltech in Pasadena this spring. In his left hand is an 80m receiver/antenna set by Siegfried Pomplun DL3BBX.

colorburst crystals on that frequency are easy to find all over the world. The finish

line beacon frequency should be at least 20 kHz away from the five fox transmitters to prevent QRM on simple receivers.

Most QRP crystal-controlled CW transmitters can be pressed into service as 80m foxes. See my article, "Super-Simple 80m Fox", in this issue of 73 for an excellent design by Rik Strobbe ON7YD. Antenna polarization must be vertical, to provide best results with loops and rods.

Shoot up your antenna

Fox transmitting antennas for 80m are easy if there are trees at the hunt site. I found that a more-or-less vertical wire 20 to 30 feet up into a tree and a single radial wire of the same length provides plenty of signal to the starting point, even on an IARU championship-size course, when used with the ON7YD transmitter.

How do you get the antenna up into the tree? And more important to a harried foxhunt organizer, how do you put five antennas into five trees in a short time? My answer: A slingshot. There are some new commercial slingshot/spinning-reel contraptions for sale to hams, but I have had excellent results with a simple twelve-dollar slingshot from the local sporting goods store. Rather than loft a leader line and then haul up the wire with it, I launch the radiating wire directly.



Photo E. For many years, 80m ARDF has been part of physical education in Russian schools, including both licensed and unlicensed youngsters. The "Altai-3.5" is one of very few commercially manufactured ham equipment items there.

For me, AWG #24 stranded wire with the multicolored Teflon jacket is just right. I found white wire with brown, black, and green stripes that camouflages well in leafy trees and on the grass. After one 80m hunt, I asked a hunter what he thought of my antennas. He said, "What antennas?"

Here are some antenna-launching tricks that I learned the hard way:

- 1) Tie a "3/8"-size lead sinker (10 grams) to the far end of the wire; launch the sinker over a high branch, and the wire will follow. Be sure to secure the transmitter end of the wire so you don't loft the whole wire out of reach.
- 2) The pile of wire on the ground must offer absolutely no resistance to being pulled up. Allow no tangles, and definitely no tree branches or other debris under the wire to snag it.
- 3) Hold the slingshot upside-down, so that as the wire falls away after launch, it doesn't tangle in the yoke of the slingshot.
- 4) Put tape over the eye of the sinker where it connects to the antenna wire. Before I did, I got a nasty cut on my fingertip from the sharp point of the eye on one launch.

NOTE: Use extreme caution with your slingshot. Wear safety glasses and watch out for others nearby. Check and obey local laws. The possession and use of slingshots may be regulated by ordinances and park rules.

The radial wire(s) can just be stretched out on the ground. I usually stick short skewers into the soil to hold the far ends of the radials in place and keep the wire from coiling up. In two locations at the June ARDF Team USA Qualifying Runs, the foxes were next to a creek, so I dropped the radials into it.

Having only one radial results in a more covert hidden transmitter, but it reduces system efficiency and makes the radiation pattern somewhat directional. If possible, run the radial in the direction of the start point, to put maximum signal in that direction. Use care to minimize the hazard of tripping over it.

Better transmitter antennas may be needed if power is lower, receiver sensitivity is less, or there is a high noise level at the site. For the ARDF Championships in Portland last year, Dale Hunt WB6BYU made antenna sets consisting of a 26-foot vertical wire, three 16-foot radials, and an RF matching transformer. His transformers were wound on Amidon T-130-2 cores, 5 turns on the primary (connecting via 50-ohm coax to the transmitter) and 55-turn secondary (to antenna and radials). I could



Photo F. Jerry Boyd WB8WFK was the only competitor at the 1999 ARDF Championships in Portland who built his own 80m receiver/antenna set from scratch. He's crossing the finish line in this photo.

tell that these antennas worked very well, as I copied the foxes several miles away on my mobile rig.

The need for tall trees for wire antennas limits the number of suitable 80-meter foxhunting sites in southern California. I'm experimenting with standalone 80-meter vertical antennas made from PVC irrigation pipe wound with magnet wire. Any suggestions from your experiences would be welcome.

Unfinished business

I incorrectly identified the hand holding the RDF set in Photo C of August's "Homing In." It actually belongs to Tony Boegeman WA6ZMZ of San Diego, California. Tony is active in both mobile and on-foot foxhunting with the Amateur Radio Club of El Cajon. He mounted the Comet KC1 RF Bug on his time-differenceof-arrival RDF unit to tell when he's within a few feet of the transmitter.

Response to my call to host the 2001 USA ARDF Championships has been good. WB6BYU, who has more ARDF hosting experience than just about anyone else in the country, reminded me to mention that corporate sponsorship and in-kind donations can help balance the budget for an event of this kind. For example, a division of Motorola provided medals for the 1999 Championships on Portland.

"Generally it is easiest to find someone to sponsor the medals," Dale says. "It's harder to get the buses paid for.

Donations require a lot of advance work. because many companies plan them over a year ahead." Don't forget T-shirts for the competitors, with a unique logo for your event.

I'm still interested in hearing from clubs and club councils interested in putting on the next multination ARDF event in this country. Details were in last month's column and are on my Web site. For that and for any RDF-related matters, use the postal and E-mail addresses at the beginning of this

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CALENDAA EVENTS

Listings are free of charge as space permits. Please send us your Calendar Event two months in advance of the issue you want it to appear in. For example, if you want it to appear in the January 2001 issue, we should receive it by November 30. Provide a clear, concise summary of the essential details about your Calendar Event.

NOV 4

LAWRENCEVILLE, NJ The Delaware Valley Radio Assn. Hamfest will be held Nov. 4th, 0800–1300 at Lawrence High School, 2525 Princeton Pike, Lawrenceville NJ. General admission is \$5; outdoor spaces \$10 (includes one admission). Additional spaces \$10/ Admission \$5. Indoor spaces \$15, includes one admission. Second indoor table \$10/ Admission \$5. Limited electrical supply. Vendor setup at 0630. For information about VE exams, check the Web at [www.slac.com/ w2zq]. Talk-in on 146.670 PL 131.8. For more info, call (609) 882-2240, or E-mail [w2zq@ artl.net].

LONDONDERRY, NH The Interstate Repeater Society ARC Annual Fall Flea Market will be held Nov. 4th at the Londonderry Lions Club on Mammoth Rd. Space is limited, so reserve it now. E-mail reservations to [Harold@ neainc.com]; or call Paul at (603) 883-3308. This event will be held rain or shine. There will be over 35 tables inside, and room for more undercover outside. Electricity is available to 13 of the 35 tables. \$2 discount to the first 10 people to provide their own table. After that it is \$10 per supplied table. Vendor setup is at 6 a.m. Early bird shoppers will be admitted 6 a.m. to 8 a.m. for \$10. Admission 8 a.m.-1 p.m. is \$3 each, Directions: Route 93 North to Exit 4 in NH. Top off the ramp left turn. Straight west on Route 102 until you pass Dunkin' Donuts on the left, next light is Route 128, turn right. The Londonderry Lions Club is about a mile on the right. Talk-in on 146.850.

NOV 5

LINGLESTOWN, PA A hamfest will be sponsored by the Central Pennsylvania Repeater Assn. at Linglestown Firehall and grounds, 5901 Linglestown Rd., Linglestown PA. Exit 26 off I-81, Exit N. Mountain Rd. off Rt. 22. Talk-in on 145.47 (WA3KXG) - offset. VE exams at 9 a.m. Admission \$5, tailgating \$5, indoor tables \$10. For indoor table reservations and/or info, call Harold R. Baer at (717) 566-8895; or write to 619 W. Second St., Hummelstown PA 17036.

MT. JOY, IA The 29th Annual Davenport Radio Club Hamfest/Computer Show will be held Nov. 5th at the Iowa National Guard Hangar, at the Mt. Joy Airport. Space is being planned for over 250 tables. Commercial vendors.

Everything from parts to complete stations. Computer hardware and software, FSTV demo. No tailgating. No food or drinks may be sold. All tables must be rented through the club: bring your own chairs. Talk-in on 146,88/,28 alt 146.64/.04, no PL. Tickets are \$5 in advance, with double prize stubs, and \$6 at the door with one prize stub. Free parking. Under 14 admitted free. Lots of prizes. You need not be present to win. Hours are Sunday from 8 a.m. to 2 p.m. Main prize drawing at 1 p.m. Setup on Saturday from 12 p.m.-5 p.m. Sunday setup 6 a.m.-8 a.m. Advance tickets via mail only: Bill Bolton WBØBBM, 28755 Utica Ridge Rd., Long Grove IA 52756; E-mail [gemobile1@aol.com]. For tables and tickets, contact Dave Mayfield W9WRL, 1819 7th St., Moline IL 61265: or E-mail [hamfest@ aw1td.coml. Tel. Saturdays. 9 a.m.-1 p.m. (309) 762-6010 and ask for Dave. Fax (309) 757-1880. When sending mail, include a business size SASE and make checks payable to Davenport Radio Amateur Club, or DRAC. Tables are \$12 each. If you need electricity, add \$1: first come first served.

NOV 11

GOLDEN, CO The 2000 Rocky Mountain Radio League, Inc. Hamfest will be held 8 a.m.-2 p.m. at Jefferson County Fairgrounds, 15200 W. 6th Ave., in Golden. Take the Indiana exit from 6th Ave. Talk-in on 144.62/145.22 MHz. Admission \$4 per person; tables \$10 in advance or at the door. VE exams, ARRL forum, refreshments, door prizes. Contact Ron Rose NØMQJ, (303) 985-8692, or E-mail [nØmgj@arrl.net].

MONTGOMERY, AL The Montgomery ARC will host the 23rd annual Montgomery Hamfest and Computer Show in Garrett Coliseum at the South Alabama State Fair grounds, located on Federal Drive in the northeastern section of historic Montgomery. Talk-in on 146.24/.84, W4AP. Ragchew on 146.32/.92 (with phone patch *up/#down), 147.78/.18, 449.50/444.50. Flea market reservations required to assure table. Tailgaters welcome, \$5 per vehicle space. For more info, write to Hamfest Committee, c/o 2141 Edinburgh Dr., Montgomery AL 36116-1313; or phone Phil at (334) 272-7980 after 5 p.m. CST. E-mail [k4ozn@ arrl.net]. Visit the Web site for late breaking news and events, [http://jschool.troyst.edu/ ~w4ap/]. Admission \$5; free parking. Inside flea market setup 3-8 p.m. Friday evening,

Nov. 10th, and 6–8 a.m. Nov. 11th. Doors open to the public 9 a.m.–3 p.m. CST. VE exams on-site, beginning at 8 a.m., by CAVEC. Bring original and a copy of your current license, picture ID, and \$3 fee.

NOV 12

CHICAGO, IL The DeVry Institute of Technology, 3300 N. Campbell Ave., Chicago IL, is the location for the Chicago ARC Ham Auction. Sunday Nov. 12th. Items in auction will be transmitters, receivers, transceivers, amplifiers, tuners, accessories, signal generators, oscilloscopes, 2-way radios, TVs, VCRs, antique radios, tubes, parts, books, computers, audio, stereo, etc. Your electronic goods will be auctioned if you bring them in before noon. All sold goods are subject to a 10% donation. If purchased back by the seller, then a 5% donation will be due. All items sold on an as-is as-shown basis. All sales final. For more info. call Dean, (708) 331-7764, morning or evening; call George, (773) 545-3622, 10 a.m.-1:30 p.m. or after 3 p.m. Remember, one man's junk is another man's gold!

NOV 18-19

FT. WAYNE, IN The 28th Annual Fort Wayne Hamfest & Computer Expo. sponsored by the Allen County Amateur Radio Technical Society (AC-ARTS), will be held at the Allen County War Memorial Coliseum at the corner of Indiana 930 (Coliseum Blvd.) and Parnell Ave. Open to the public 9 a.m.-4 p.m. EST on Saturday, and 9 a.m.-3 p.m. EST on Sunday. Vendor setup is Friday evening and Saturday morning. Admission \$5, good for both days, at the door only. Parking is \$2. There are over 1100 commercial and flea market tables all under one roof, containing both new and used radio, computer, and general electronics items. Activities will include many forums and meetings, with VE exams on Saturday. Shuttle bus service provided to and from Smith Field Airport, and shopping centers. Talk-in on 146.88(-). For more info, leave a message on the answering machine at (219) 483-8163 (tables), or (219) 484-1314 (general info), and you will be contacted. You can also send an SASE to AC-ARTS / Fort Wayne Hamfest, P.O. Box 10342, Fort Wayne IN 46851; or visit the WWW site at [http://www.acarts.com].

NOV 19

BENSON, NC The 12th Annual JARSFEST

will be held Sun. Nov. 19th at the American Legion Complex in Benson NC. Talk-in on 147.27 (+600). Dealers, tailgate section, VE exams. For further info, call (919) 894-3352 or (919) 894-3100, 7 p.m.-10 p.m. The Club Web site is at [www.jars.net]. E-mail [blambert@ interpath.com].

NOV 25

EVANSVILLE, IN The 8th Annual Evansville Winter Hamfest will be sponsored by E.A.R.S. and The Ham Station, Nov. 25th, 8 a.m.-2 p.m. at Vanderburgh Co. 4-H Center Fairgrounds Auditorium. Talk-in on EARS Wide Area Repeater Network 145.150(-) Evansville/ 146.925(-) and 443.925(+) Vincennes. Alternate: EARS repeater 145.110(-). Use 107.2 CTCSS on all frequencies listed! Vendor setup 5 p.m.-9 p.m. Friday; 6 a.m.-8 a.m. Saturday, Central time. Admission \$5. Free parking. Free tailgating. Indoor flea market. Table space available. Commercial dealers. 8-ft, flea market tables \$8 each; wall spaces \$10 each if money received by Nov. 15th. Add \$2 each after Nov. 15th. For table reservations or info, contact Neil WB9VPG at (812) 479-5741; or write EARS, 1506 S. Parker Dr., Evansville IN 47714. E-mail [ears@w9ear.org]. Hamfest Web site at [http:/ /w9ear.org/hamfest.htm].

SPECIAL EVENTS, ETC.

NOV 4-5

HUNTINGTON, WV The Tri-State ARA and the world-renowned Museum of Radio & Technology, of Huntington, will team up to operate a special event from the Museum's station WV8MRT, 1700 UTC Nov. 4th-1700 UTC Nov. 5th. This event highlights the museum's celebration of 100 Years of Radio, making a full century since Marconi invented the wireless. Main frequencies of operation will be 7.240, 14.240, 21.340, and 28.340. For a certificate, send QSL and 9 x 12 SASE to Tri-State ARA, P.O. Box 4120, Huntington WV 25729 USA.

NOV 25-26

MOROCCO The Bavarian Contest Club will be operating again as CN8WW from Morocco in the CQ WW Contests. They will be a Multi/ Multi team, so there is a very good chance to work CN on all bands from 160-10m. A new picture QSL card is being offered for the upcoming activities. Work CN8WW on 5 or 6 bands and receive a special QSL card to honor your high performance. QRG's ±QRM: 1.833. 3.503, 7.003, 14.033, 21.033, 28.033 kHz. Before and after the contest, they will operate as 5C8M in CW, SSB, RTTY, 6m, and also on the WARC bands. For more info check the Web at [http://www.dl6fbl.de/cn8ww/], QSL cards for CN8WW and 5C8M go via DL6FBL (buro or direct): Bernd Och, Christian-Wirth-Str. 18, D-36043 Fulda, Germany

DEC 8-9

BETHLEHEM, IN The Clark County ARC will operate W9WWI, 1500Z Dec. 8th-2200Z Dec. 9th, in celebration of the Christmas season. Operation will be on General 75, 40, and 20 meters. QSL with an SASE for a certificate to CCARC, 1805 E. 8th St., Jeffersonville IN 47130 USA.

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✓FREE from Universal Radio: "Guide to Military Monitoring"

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Work Wonders with WinWarbler 1.6.5

A fine new piece of PSK31 software found me lately. It was working when I first downloaded it some time ago, but it was still early in the developing stages. And developments came rapidly, as I followed and used this unique approach to software for our increasingly popular mode.

A t this writing, I have just downloaded version WinWarbler 1.6.5, which must be at least 15 updates on the original 1.3 series I first used. That first version worked pretty well, but was plagued with crashes. The author, Dave AA6YQ, found the cause of the crashes, which seemed to be caused by something in Windows as I recall, and it has been smooth sailing ever since.

The display has three receive panes and a broad spectrum display, which makes it a real contender during any competitive operating exercise. Plus, it allows you to watch one ragchew while you check to see who is calling CQ. You can select any of the three panes simply by clicking on it and then, when you move the cursor to the spectrum display, wherever you click is where that pane will start tracking and displaying copy.

The package is easy to set up and get operating. After that, you will find the program to be extremely intuitive — it's designed by a ham who understands how I like to operate a program. Some have expressed the opinion that it could soon rival DigiPan for popularity due to its ease of setup and excellent documentation.

I have been having fun with this program, and you can, too. It is as easy to download and get up and running as any program available today. The more I work with it, the better the experience becomes. In just a short time, the program has taken on all the creature comforts I have begun to take for granted, plus a few more.

Dave has included an easy to use minilog that writes a log file in ADIF format and is ideal to import into Logger. It works well with that program, which is also free for the download. I know, because I gave it a try as soon as the log was put in the program, and the import was flawless. And if anybody can screw up something that works for everybody else. I am the hands-down champ.

There is an adequate set of macros for your editing pleasure. I wrote macros for the areas I feel are normal and had all the available buttons used, even after some judicious combining and selecting. I suggested to Dave there was a need for a few more, and within a few days he made an Alt+Function set available along with a simple selection process.

I like to use defined keyboard keys for macros so that I can keep my hands in one place. You can either click the function keys on the monitor screen or use the keyboard, whichever works for you. The buttons on the screen are identified by function key number and, as you define the macros, the title is displayed on the key. All the info you need is on the screen. You won't need a list taped to the side of the monitor.

Another built-in piece of intuitive coordination is that the color of the pane is reflected in the color of the vertical line in the spectrum display that corresponds to the frequency you are tuned to. It is easy to quickly identify where on the spectrum each pane is tuned and determine what is or is not working.

You can control the colors of the three receive panes so they can reflect your choice of favorite colors. I changed mine, but only for a short time. Pretty colors are nice, except that it is too easy to arrive at a color scheme that becomes difficult to read. It didn't take long to return to original selections. They might be termed "default," but there is not a default selection for colors, so a word of wisdom (from experience): Keep track of where you start.

If you are already using one of the popular soundcard programs for PSK, your cables and PTT setup should work just fine. This is an area that has become nearly standard with most programs. I have two Icom rigs and in that case both rigs connect the

same, but more importantly, I can use most of the current software without changing any settings or using any different cables between the radio and the computer. And that is with the use of the accessory connector on the back of the Icom and the commonly recommended serial port-activated PTT circuit.

I mention this as there are often discussions about using other methods to interface the computer and the radio. In some cases, hams are able to successfully use the mic connector for audio input and output with home-brew attenuator circuits. This sounds like a good way to go, until you talk to those who have had trouble building adequate attenuator circuits.

Along with that is the problem of controlling PTT via VOX when employing the mic connector interface. Now, there is something else out there and I have not had my hands on the unit as yet, but I talk to a lot of happy users. A little box is being sold under the name of RIGblaster. Check the URL in the chart.

I can only endorse this unit as far as hearsay will stretch at this time. However, I have not heard anyone say they couldn't make the interface work, and every user I have talked to over the air has had a very clean transmitted signal. So, if it is as good as it sounds, it is a very good deal. An assembled unit that is virtually plug and play. I see already-made-up cables listed, which makes for a neat installation without the assembly hassle.

And the package is apparently a lot more successful than the "plug 'n' pray" that became common in the computer industry a few years back. Now that I have said those nice things, I hope I do not receive a deluge of negative reader response. That can be a problem when you only hear the good from others and then pass it on.

You will also be pleased with the documentation for WinWarbler. With the versions I have been using, the program is not as yet displaying the help files on its own, but nearly so. I downloaded all the help files from the Web site and found that when I clicked on the "Help" button, my Netscape browser would come up and display the help files. It did it so well and so quickly the first time, I had to do a double-take to see what happened.

The point is, you will find everything you need to get going, write macros, and configure the program. If you are not already using a soundcard program, you will find a link from the Web site to the WM2U Web site with all the information you need to answer your questions. (See the chart.)

Plus, you will find, if you decide to make your own PSK31 interface, that the info available is about as simple as it gets. You will make up two audio cables from your soundcard to your rig, and you will find that is a barebones hookup that will allow you to copy PSK31. You can transmit as well, by manually toggling the transmit on your transceiver. A lot of us did this in the beginning (many still do) and it works.

You will, if not at first, at some point want to build a PTT circuit, and that is described for you through the link. With those three connections made, the operation of your radio will seem automatic.

There is another facet to all this. I did not dwell on the fact you need not carefully move your tuning knob on your receiver to get the PSK31 signal "dead-on" for proper reception. Most PSK31 programs allow you simply to click on the received signal and have the magic begin.

However, Dave carried it another step. He uses a "xcvr freq" box, where you can enter the frequency from your transceiver. Then the spectrum display is automatically calibrated for the frequency of the station you are working. This resultant frequency reading is then entered into the log so you know what your operating frequency was rather than just "20 meters." Take a look at the screen shot and the numbers above the waterfall.

This means that your log will include the frequency worked along with the other pertinent information you like to enter into the record. Speaking of logging, Dave has made the mini-log very responsive, in that it not only makes the log info available in ADIF format, but also you can clear the log using a mouse/keyboard combo once you have imported the current info into your regular log program.

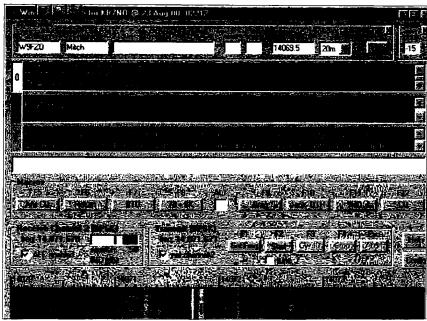


Fig. 1. Screen shot of WinWarbler 1.6.5. This shows each receive pane containing text that is being copied simultaneously. The only one not tuned to a signal is the middle pane, where I had just signed with a ham. All that was necessary to log the QSO was to click the "log" button, and the next station could be worked. Each pane has its unique color, which matches the vertical tuning bar in the waterfall at the bottom. The white space is the transmit window that supports type-ahead. Your macros will display there also. The eight definable function keys, F5 through F12, carry the ID on the screen that you give them during programming. They will do double duty with the help of the Alt key, and that can be toggled by clicking on the box in the center of the row. This gives a total of 16 macros you can define that are easy to spot in the screen, no list needed. An idea of the popularity of this mode can be gained from the waterfall, with at least 10 signals showing. Note the frequency indicators above the waterfall. These are as accurate as you allow them to be, according to your entry at the top of the screen.

This is a convenience when compared with other programs' mini-logs, where it is necessary to manually locate and delete the information from the file to avoid double imports into your log program. Still, you must remember to clear the entries — otherwise, it becomes necessary to remove the duplicates after they are imported a second time. So many things to remember — a person can get a terrible headache while having all this fun.

I almost forgot to mention the trick spectral display that was recently added to the program as an option to the waterfall. These displays work better for the eyes for some folks who do not like to watch the waterfall for tuning. Additionally, there is a provision to change the colors on the waterfall for another variation of the display.

All in all, this is one whale of a program. You will find all the bells and whistles you could ask for, a complete set of instructions for hardware wiring, and full documentation on the use of the program — and it is free for the download. (See the chart.)

Other modes are still waiting in the background. I watch for more activity with the multi-tone modes and only see limited contacts being made. It seems that the PSK31 mode really took off, and it deserves all the attention it is getting. It works with low power and is easy to set up, and new software such as WinWarbler is being introduced regularly.

When I work the folks on RTTY, it seems there are few who haven't wondered what this soundcard craze is all about. Many RTTY hams who have not yet tried PSK31 are continuing to use the hardware-driven systems and do not realize how easily they can get into the new mode.

Interestingly, many who change become "converted" and seldom return to the RTTY ... except at contest time. If there is something that will retain the RTTY proponent it is the contest.

I talk to some who are only vaguely aware of programs such as MixW and TrueTTY, which make RTTY available on the soundcard, as well as PSK31 and other

Source for:	Web address (URL):
Mix W Soundcard program for PSK31, RTTY, new modes, MTTY, FSK31, more	http://tav.kiev.ua/-nick/my_ham_soft.htm http://users.nais.com/-jaffejim/mixwpage.htm
TrueTTY — Sound card RTTY w/ PSK31	www.dxsoft.com/mitrtty.htm
Pasokon SSTV programs & hardware	www.uitranet.com/~sstv/lite.html
PSK31 — Free — and much PSK info	http://aintel.bl.ehu.es/psk31.html
Interface for digital - rigs to computers	www.westmountainradio.com/RIGblaster.htm
Interface info for DIY digital hams	www.qsl.net/wm2u/interface.html
Site with links to PSK31 and Logger 7. Also Zakanaka and scope program	www.chroniclenetworks.com/~dwm/logger-zakanaka.htm
PSKGNR — Front end for PSK31	www.al-williams.com/wd5gnr/pskgnr.htm
Digipan — PSK31 — easy to use — new version 1.2	http://members.home.com/hteller/digipan/
TAPR — Lots of info	www.tapr.org
TNC to radio wiring help	http://freeweb.pdq.net/medcalf/ztx/
ChromaPIX and ChromaSound DSP software	www.slliconpixels.com
Timewave DSP & AEA products	www.timewave.com
Auto tuner and other kits	www.ldgelectronics.com
XPWare — TNC software with sample DL	www.goodnet.com/-gjohnson/
RCKRtty Windows program with free DL	http://home.t-online.de/home/dl4rck/ [use lowercase DL4RCK]
HF serial modern plans & RTTY & Pactor	http://home.att.net/~k7szl/
SV2AGW free Win95 programs	www.raag.org/index1.htm
Source for BayPac BP-2M & APRS	www.tigertronics.com/
BayCom — German site	www.baycom.de/
BayCom 1.5 and Manual.zip in English	www.cs.wvu.edu/-acm/gopher/Software/baycom/
N1RCT site — excellent RTTY ref.	http://www.megalink.net/~n1rct/
Int'l Visual Communication Assn. — nonprofit org. dedicated to SSTV	www.mindspring.com/~sstv/
Creative Services Software	www.cssincorp.com
Hellschreiber & MT63	www.freeweb.org/varie/ninopo/iz8bly/index.htm

Table 1. The goodies list.

fascinating modes. I know my PK-232MBX has been gathering dust for the last few years. The only thing not available for a soundcard is PACTOR, and that is because of licensing fees. How our world changes.

Tracking your movements?

When I was mentioning deleting files, I was reminded of something. I have gotten a little miffed (more like exceedingly displeased) with the demand to allow

If you're a No-Code Tech, and you're having fun operating, tell us about it! Other No-Code Techs will enjoy reading about your adventures in ham radio—and we'll pay you for your articles. Yes, lots of nice clear photos, please. Call Joyce Sawtelle at 800-274-7373 to get a copy of "How to Write for 73 Magazine."

the installation of "cookies" in my computer when I am accessing the Internet. I get a lot of stories on this, and it is passed off all the way from a subversive activity by the federal government to a helping hand from Internet commercial gurus so I will more easily find what I want on the Internet.

That last statement is a crock of youknow-what. For whatever it is worth, if you are not aware, commercial list makers are placing the cookies and gathering information about your interests (not mine anymore), so they can compile demographic files and sell them to marketing companies who, in turn, can offer you all those oncein-a-lifetime, too-good-to-be-true deals through the mail (shredder fodder) and over the Internet.

A cookie is simply a short text file that uniquely identifies your computer for anyone who has the capability of tracking these cookies. By tracking, your every visit to any Web site is recorded and compiled at some great compiling station at an undisclosed location.

I object to the whole idea of someone messing with my computer while I am not watching them. So, I came up with a solution. I let these used car-lot style salesfolk put their cookies in a file in my computer so I can be allowed access to their Web site. Then I remove them.

At least once a day, I go to the [cookies. txt] file and delete the contents. You can do the same if you do not wish strangers tracking your every move on the Internet. The operation can be performed either from DOS or by simply checking the directory where your Internet browser resides in Windows. I find the fastest js to do a "Find" for [cookies.*] and then double-click on the file when it comes up. This prints the file on the screen in an editor and the rest is up to you. (Select and delete.)

I learned very early that these intruders into my sanctum feel they are far more important than I am and are quick to tell me to buzz off if I complain about their activities. So the simplest way to keep them out of my hair and still be allowed access to "their" territory is to use the above approach.

As I mentioned, it has been claimed that the government has the capability of checking on their citizens' interests for other means. I haven't seen a cookie I could identify to a government source, so that last claim may be simply rubbish or else the ones who need tracking have cookies fashioned for their needs, All is possible.

If you have questions or comments about this column, E-mail me [jheller@sierra.net]. I will gladly share what I know or find a resource for you. For now, 73, Jack KB7NO.

Mobile, Portable and Emergency Operation

Steve Nowak KE8YN/4 1011 Peacock Ave. NE Palm Bay FL 32907-1371 [ke8yn@netzero.net]

Mobile HF Lessons From the Hamfest

This weekend we had our local hamfest here in Melbourne, Florida. Besides all the obvious equipment treasures, hamfests tend to provide a wealth of opportunities for writers. There's the chance to see old friends and catch up on what you've missed. There's the chance to have a face-to-face QSO and finally put a face with that voice and call you've spoken with but never met. And, unfortunately, there is the chance that one may find out that the reason a particular station hasn't been on the air lately is because he or she has become a silent key.

I am pleased to report that the Amateur Radio Emergency Service (ARES) table was quite busy even though it was located a bit out of the way. People were lined up to get their picture taken for ARES identification cards or just to chat with other hams involved in disaster communications. It is always gratifying to see how hams are not only willing to help out in an emergency, but how they're also willing to meet the requirements to ensure that they will be ready if called upon to serve.

Naturally, there is also the chance to make meaningful technical evaluations and comparisons. Therefore, when I arrived at the hamfest site I immediately checked out the vehicles in the parking lot. While some people (normal people?) might be inclined to compare the makes and models and years of the automobiles themselves, we hams check out the important features — what kind and how many antennas are present and how they are mounted. I must admit I was surprised by the number of cars with HF antennas. I catch a fair amount of good-natured razzing from nonham friends because of the antennas on my car, but I must admit that even I was quite jealous of some of the vehicles I saw in the parking area. Screwdriver antennas, bug-catchers, and multiband systems with multiple resonators were as common as ants at a picnic. From the view in the parking lot, it would seem that the current band conditions have made quite a mark on the interest in talking with the world from our cars and trucks. On the other hand, it may not be just the conditions but may reflect the availability of high quality, easy-to-use equipment that lends itself so easily to mobile use. This got me to thinking about this phenomenon.

Recently, when the hobby of amateur radio underwent its restructuring. a lot of the
discussion concerned the change in the requirements to demonstrate the ability to
communicate by the use of Morse Code. At
the time, many of us reflected on the
changes in our hobby so that we are no
longer dependent, as we once were, on
Morse Code as the single mode we could
use to communicate. Instead, of course we
can choose from among a whole range of
modes, which has made the dits and dahs
of CW, while still enjoyable, less critical to
our hobby.

The capabilities we take for granted today totally outstrip any of the expectations that many of us had even a few years ago. Who would have thought we'd be marrying global positioning satellite (GPS) systems with packet radio for Automatic Packet Reporting Systems (APRS)? Digital Signal Processing was quite an exotic (and expensive) accessory only a few years ago. Today, it is a common feature on many reasonably priced transceivers. For that matter, what isn't included in most mid- to upper-end transceivers? It wasn't that many years ago that I obtained a used transceiver which, when paired up with its accessory cabinets, covered the best portion of a desk. A few years later, I purchased a transceiver from the same manufacturer that was only two models newer and included all the same features in a single unit about the size of the proverbial breadbox.

This technology growth has not only made the ability to operate HF from the average automobile or van possible, but also made it downright common. It was not too many years ago that a transceiver required 110 volts AC to operate, occupied a lot of

space, was quite heavy, and produced a significant amount of heat. Now, a rig with allband capability can fit into a very small package and put out 100 watts of power. Today, most rigs are designed for 12-volt DC operation. I saw a lot of interest at the hamfest in both new and veteran rigs to be used in mobile applications. But is it just the technology that has led to the growth in interest in mobile operations?

It seems like we are all facing the crunch of time, and for many of us the only opportunity to get in some DX hunting is while on the road. After a ten- or twelve-hour workday, many families expect to have a little time spent on them, rather than huddled over the rig in the ham shack. On the other hand, the commute to and from work or the trip from one work location to the next provides excellent opportunities to work a few exotic stations.

Currently we're at a good point in the sunspot cycle, which has made operating conditions much better for HF operations. The higher frequency bands such as ten meters provide excellent operating characteristics. A ten-meter antenna is reasonably sized for mobile use and provides relatively good coverage throughout a fairly spacious band. Besides the ability to operate sideband, one can also choose FM and use one of the many repeaters available throughout the world.

It could be the challenge, of course. After all, when the big guns are putting a kilowatt into stacked monobanders at 120 feet, cutting through the pileup with a hundred watts into a short vertical does provide a sense of satisfaction. Anyone can operate

Continued on page 58

NEW PRODUCTS

Mini-News from MFJ

- QRP-Cubs are complete single-band transceivers that fit in the palm of your hand. Using SMT, these rigs achieve big-time performance with mini-sized package. The kits provide all SMT parts mounted and soldered; you just insert and solder the through-hole parts such as connectors, inductors, and trimmers. Designed by QRP-ARCI Hall-of-Famer K1BQT. Available for 80, 40, 30, 20, 17, and 15 meters. MSRP; MFJ-93XXK (kit), \$99.95; MFJ-93XXW (wired and tested), \$149.95.
- The MFJ-134 (24-hr.) and MFJ-132 (12-hr.) transparent clocks are cool! Their see-through display makes the numbers seem to float in midair, so don't run into these giant 1-3/4inch-high digits as you walk across the shack. Alarm, snooze, operates on two AA batteries. MSRP: \$34.95.
- At long last, some good coax patch cables. Here are 3-, 6-, 18-, and 50-foot lengths of RG-8X terminated in a molded, weatherresistant PL-259 connector on one end, open on the other. The MFJ-5850 50-footer has an MSRP of \$17.95; shorter lengths. less — please inquire.
- The MFJ-1709 foot switch can greatly improve your efficiency by reducing fatigue - a great bonus regardless of whether you're a contester. Cushioned foot pedal on nonskid pad, 1/4-inch phone plug, 10-ft, cord, MSRP: \$21.95.

For further information about these or other MFJ products. please contact MFJ Enterprises, Inc., PO Box 494, Mississippi State, MS 39762; tel. (800) 647-1800; fax (662) 323-6551; Email [mfj@mfjenterprises.com]; Web [www.mfjenterprises.com].



Icom's IC-718 HF Xcvr

Although officially designated an "entry-level" rig, the IC-718 is still packed with features: simplified band stack register; direct frequency input; VOX; FSK; optional DSP; 1-Hz tuning; and of course more. Front-facing speaker and LARGE LCD readout are just two reasons this design is very op-friendly. too. Coverage includes 0.03-30 MHz; 101 memory channels available. Suggested MSRP: under \$900.

For further information about this or other Icom products, please contact Icom America, Inc., 2380 116th Ave. N.E., Bellevue WA 98004; tel. (425) 454-7619; fax (425) 454-1509; Web [www.iconiamerica.com/amateur/hl].

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ATOC Technologies, Inc.,

home of IronHorse heavy-duty antennas and accessories has issued a new catalog featuring their complete line of mobile HF antennas and systems; dualband and VHF antennas: mag mount antennas and kits: and mounts and accessories.

For further information about this 6-pager, contact ATOC Technologies, Inc., PO Box 36, 23 South High St., Covington OH 45318; tel. (937) 473-2840; fax (937) 473-2862; site [www. atoctechnologies.com].



The Best of Beasley

If you're thinking about getting this 60-page booklet (115 cartoons) as a stocking stuffer for yourself or someone else. make sure the insurance premiums are paid first — someone is bound to bust a gut. This is a collection of the best of K6BJH's work over the years, as it appeared in ATV Quarterly (although these are not all ATV-oriented, by any means!). At \$8.95 plus \$3 s/h (\$6 overseas), the price is also laughingly low.

For further info or to purchase, contact Harlan Technologies, 5931 Alma Dr., Rockford IL 61108; tel. (815) 398-2683; fax (815) 398-2688; orders (800) 557-9469.

Millennium Key

Morse Express has announced the availability of a limited edition Millennium Key, made by Llaves Telegraphicas Artisanes in the Balearic Islands of Spain. This limited edition (100) has the same mechanism as the LTA Model GMO, but also the following special features: hand-selected parts, highly polished and goldplated; ebony knob and base; official certificate with serial number; and wood presentation box with red felt lining. \$89.95

For further information, contact Morse Express, 2460 South Moline Way, Aurora CO 80014-1833; tel. (303) 752-3382; fax (303) 745-6792; orders (800) 238-8205; E-mail [hq@ MorseX.com]: Web: [www.MorseX.com].

If Your Xcvr Goes Brain-Dead

With the launch of Phase 3-D imminent last month, I decided to check out some of my microwave gear that had been getting dusty since AMSAT-OSCAR-13 became a shooting star a few years ago. The results were unexpected. My 2.4 GHz (13cm) tower-mounted receive converter was dead, and my all-mode Icom IC-1271A 1.2 GHz (23cm) transceiver was acting as if it were brain-dead.

I the two problems I discovered, the 13cm receive converter was not a serious concern. Since I purchased the unit from Germany several years ago, I had collected a number of other 2.4 GHz units that, with some modifications, could easily and inexpensively, take its place. My receive converter is mounted within two feet of the semi-dish antenna that is an integral part of my hamsat antenna array. It has been out in the weather, and may have developed a leak or, if I'm lucky, the power cable has simply shorted or opened. It will be investigated during the cooler winter months. The most disturbing discovery, however, was the situation with the Icom IC-1271A. The display showed bizarre frequencies, when it worked. I had heard rumors that the rig's software was stored in battery-backed-up memory. This sounded rather foolish, so I had discounted it as some kind of ham-radio urban legend. Surprise! They were right.

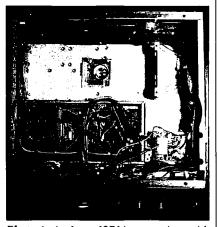


Photo A. An Icom 1271A transceiver with a new memory board from Italy to replace the original Icom unit shown above.

Dismay

I purchased my IC-1271A almost 15 years ago. In the early 1980s, I had been using a European transverter to make terrestrial 1296 MHz contacts, but needed something that would tune down to the 23cm satellite band around 1269 MHz, in order to use the Mode "L" (23cm up and 70cm down) transponder on AMSAT-OSCAR-10. At the time, the only commercial rig that could do the job was the IC-I271A. I bought it. I made my first Mode "L" contact with Rip WA2LQQ on April 5, 1986. Seven L-mode QSOs later, the computer on AO-10 was dead. I now had a 23cm radio with no 23cm satellites in the sky. AO-10 still worked, but it could not be commanded for predictable Mode "L" operation. Fortunately, 14 years later, AO-10 is still working as an exceptional Mode "B" (70cm up and two meters down) hamsat, but Mode "L" is history.

Four and a half years later, in 1988, I was again using Mode "L" with my 1271A, but this time via AMSAT-OSCAR-13. This hamsat transponder was more sensitive than that on AO-10, and contacts were easier and more plentiful. Using a tube-type 23cm amplifier and a 45-element loop yagi, I made many contacts.

But before AO-13 was in orbit, I found that the IC-1271A could be a lot of fun for terrestrial long-distance (DX) work, and with the optional TV-1200 module, provided excellent 1.2 GHz AM amateur television (ATV) operation. After AO-13 reentered the atmosphere, the rig was used for a while for local AM ATV, but then became a dust collector. There were so many other exciting satellites to chase, so the loss of 1.2 GHz hamsat work was not a problem. But while my radio sat dark and silent on the shelf for years, I had no idea that its

operating system and memorized channel frequencies were stored in volatile memory, tentatively held in place by a single lithium "coin cell" battery from the mid-1980s.

A typical coin-cell battery lasts about 10 years. In an air-conditioned environment like my radio room, it may last up to 15 years if the current consumption is low. Mine lasted about 14 years.

In 1992, 1 had purchased a service manual from Icom for \$35. It contains numerous schematics and complete, well-written, information about the radio, complete with parts lists and tune-up procedures. There is, however, a significant gap concerning the RAM unit. The description of this daughterboard, which is attached to the logic unit on the bottom side of the radio, is lacking. Its purpose, significance, and service requirements are not mentioned. When my 1271A began losing its mind, I had no information on what to do about the dead battery.

The obvious fix was to replace the battery. Unfortunately, it was soldered into place. I found a suitable battery holder on an old PC communications board. I removed the old solder-tab CR2325 battery and replaced it with the holder. I got a new non-solder-tab CR2325 from Radio Shack and inserted it into the holder. Power up! The radio was still dead. Nothing seemed to make a difference. When the original battery died, so did the software that ran the radio. I was not pleased.

The search

My first reaction was to contact Icom, but I did not want to repeat my previous mistake of trusting a radio that was dependent on battery-backed-up programming. So I put out a cry for help to the AMSAT-BB remailer on the Internet [amsat-bb@

amsat.org]. Replies were numerous. The urban legend was true. There was no way that I could fix my radio without outside help. It was brain dead. I had three options: trash or sell the rig, buy a new RAM unit from Icom, or get a better replacement daughterboard from another source with operating code burned into nonvolatile memory.

The first option of trashing the rig was not acceptable. I have radios that are over 50 years old that still work great. I had spent nearly \$1,000 for the Icom 1271A and had no intention of selling it as junk or throwing it away. It is a mere youngster compared to some of the rigs I have in active service.

The second choice of contacting Icom was obvious, since they designed and built the rig. I hoped that they could help. Icom maintains an Internet presence at [http://www.icomamerica.com]. I went there and discovered that I could visit their technical support site at [aol.com] or call them on the phone during California business hours. Since I don't have an AOL account, I called their Technical Support-by-Phone number at (425) 454-7619. The operator on the other end was a bit clueless about the RAM unit in the 1271A and promised to call back later.

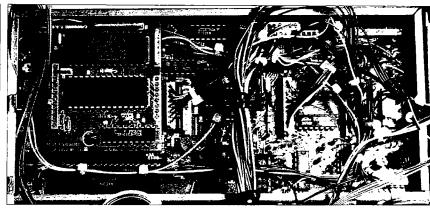


Photo B. Close-up of the IK2RND EPROM/ RAMBOARD memory unit as installed in an Icom 1271A 23cm transceiver.

I'm still waiting. Other independent Icom representatives or repair centers like Malcom Technical Support [mts@plix.com] might be better than the home office.

My preferred choice was to find a thirdparty, non-Icom source for a replacement for the RAM unit, which would not have the same design flaw (operation software in battery-backed RAM). E-mail from Mark KØMDJ mentioned a review in the July 1994 issue of *QST* (page 79) addressing the third-party nonvolatile option. Mike K4HN provided the Internet URL (Universal Resource Locator) for the company that had it, Wilco Electronics [http://www.ameritech.net/users/wilco788/myl.htm]. A second likely solution came from Woody KJ4SO. Woody owned an IC-271 and had purchased a direct, plug-in replacement daughterboard from Roberto Nardo IK2RND [Roberto.Nardo@pv.infn.it]. Woody highly recommended Roberto's

Continued on page 52

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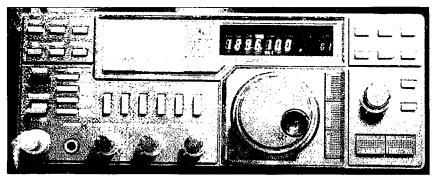


Photo C. The Icom 1271A transceiver back in service after a nearly disastrous memory failure.

HAMSATS

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solution and encouraged me to send E-mail at my earliest opportunity.

Surprises and solutions

I now had two possible sources for a correctly designed RAM unit replacement, one domestic and the other in Italy. I checked out the Wilco Electronics Internet site and was surprised to discover that there were several Icom radios with the same problem.

Six models listed on the Wilco page included the IC- 271, IC-471, IC-1271, IC-745, IC-751, and the R71A. All of them apparently use the same replaceable plugin memory module with operation code loaded into battery-backed RAM — time bombs ready to make the radios brain-dead. The base price for the Wilco ICM-1024B is \$134.95 plus shipping. In addition to holding the rig's operating software in nonvolatile memory, there are frequency-expansion enhancements and more memories (from the base 32 to 1024) available for some of

the six radios. E-mail to Jack Albert WA9FVP [wilco788 @ameritech.net] yielded a fast response with additional information. and the caveat that the ICM-1024B had never been tested in a 1271 or 471, but works fine in all of the IC-271 transceivers, in addition to the HF rigs and R71A receiver.

I also sent E-mail to Roberto IK2RND. The next morning, 1 had a reply. Roberto's replacement board did not provide extra memories beyond the standard 32, but did include extended frequency coverage for the IC-751, IC-751A, IC-745, R71A, R71E, and the IC-271. The IC-471 and IC-1271 are simply provided, with the advantage of being back on-line and not subject to losing their minds to dead batteries. The cost for Roberto's EPROM/RAMBOARD is \$60 cash — airmail shipping included. After considering the options afforded by the two choices, I carefully folded three new \$20 bills in half, taped them between two of my QSL cards with a note, and sent it all in a securely sealed envelope to: Roberto Nardo, via Marchesi 27, 27100 Pavia, Italy, Europe. Eight days later, I received a padded envelope from Italy.

Success

The envelope from Italy contained a very professional circuit board, a QSL from Roberto, a curious two-conductor wire assembly with a diode, an annotated logic unit circuitboard pictorial, and a two-sided instruction sheet. The instructions were well written and very easy to follow. I skipped the part about how to get into the radio. Mine had been gutted on the workbench for a number of weeks. The remainder of the instructions required that I unplug the old RAM unit and replace it with the new EPROM/RAMBOARD. That's it! I powered up my IC-1271A and was back on the air in only a few minutes.

But there's more. The back side of the instruction sheet had details on what to do when the new battery died in about seven years. The RAM memory contains the 32 programmable channels and the last settings of the VFO A/B frequencies. The operating software is safely in the nonvolatile EPROM, but there is a sequence of things that must be done when replacing the lithium coin cell. The wire and diode assembly that came with the new board is used according to the simple sequence of instructions, in conjunction with the annotated pictorial sheet, to reset the memory. I have carefully placed these items inside my user's manual for possible use sometime around the year 2007. Until then, I have 10 watts, on any mode, ready for Phase 3-D or any other hamsat that has a 23cm uplink. I also have a radio that won't lose its mind the next time a battery dies. Do you have an IC-1271A or one of the other radios mentioned? The clock is ticking.

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Add-On Digital Voltmeter

Strictly for those who love to build it themselves.

While building a power supply for use in the shack lately, I thought that it would be nice to have a way to know what the voltage on the output was. Since the supply that I was constructing was going to have a variable output, this would add a nice feature to it. I could use a standard-type meter, commonly found at parts stores or mail order catalogs, but I thought that I would "dress" it up a little and opt for a digital-type display. This would be a more accurate way to measure, if I ever needed to do so.

started to search for a way to accomplish this. I could purchase a Ldigital display ready to go from a box, but being of the building type, I feel guilty when I do this sometimes. I decided that I could build this feature also, if I could find some information on the subject. While looking at an older IC data book, I ran across an analog-to-digital converter that would do the job nicely. And the best part was that it did not use any very expensive parts. A quick check in some parts catalogs and on the Internet told me that the parts I was looking for were still around.

The IC of choice is an analog-to-digital converter, the CA3162E, that does the nice job of providing an output to drive a display driver, the CA3161E, and displays the information on a 3-digit digital display. Just the thing to keep an eye on our output voltage, while it is being varied.

The range of the finished "Add-On Digital Voltmeter," as built, will display any voltage in the range of 0–99.9 volts. It will also show an over-range condition with EE.E on the display. But this feature would probably not be a concern, as our variable power supply could not reach this amount on its output.

Refer to the schematic diagram, Fig. 1. The power to supply the "Add-On Digital Voltmeter" can be supplied from a separate DC voltage source or, as in our case, directly from the source that it is measuring. About 10–15 volts is good to work with. This will keep our "on board" voltage regulator, U3, happy. The input voltage to the regulator is polarity-protected by the diodes D1 and D2. The 5 volt regulated output

is supplied to the A/D converter U2 and display driver U1, respectively. It is also used in the voltage divider circuit of R1, R2, VR3 for use as a 0.9 volt calibration source. (More on this later.) Resistors R3, R4, VR4 form a voltage divider circuit to "scale" our input voltage that we wish to measure down to a level that can be safely used at the input of our A/D converter.

One critical component is C3. A

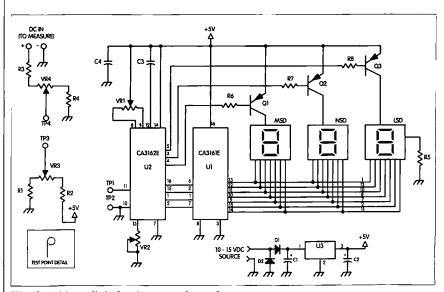


Fig. 1. Add-on digital voltmeter schematic.

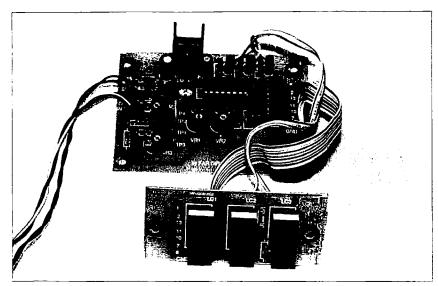


Photo A. Finished voltmeter showing digital display.

high-quality polyester type should be used here, as this component is used for timing by the A/D converter. Q1, Q2, Q3, are used as digit drivers, while

the outputs of the display driver, pins 9-15, are wired to the common anode displays in multiplex fashion. Test points, shown on the schematic, will be

Calibration Instructions

You will need to use a digital voltmeter to make some of the adjustments. Set the trimmer potentiometers VR1-VR4 to their center positions as a starting point.

- **Step 1.** Provide 10–15 volts to the PC board at + and VDC.
- Step 2. Check output at U3, pin 3 for 5 volts.
- **Step 3.** The display should read EE.E
- **Step 4.** Attach a test lead with clips between TP1 and TP2. Adjust VR1 for a display of 00.0, then disconnect the test leads from TP1 and TP2.
- **Step 5.** Attach a digital voltmeter (DVM) from TP3(+) and TP2(-). Adjust VR3 for 900 millivolts (.900 on the meter you attached). Disconnect the test leads to this meter when done adjusting. Attach test lead with clips between TP3 and TP1. Adjust VR2 for 90.0 on the Add-On Digital Voltmeter display. Disconnect the lead with test clips when done adjusting VR2.
- **Step 6.** Using a small piece of insulated hookup wire, connect (jumper) TP1 and TP4 with this wire and carefully solder in place. This wire will remain in place after calibration, so be neat when attaching.
- Step 7. Connect wires with test clips to + and DC of Add-On Digital Voltmeter board. Connect these to a known DC voltage. You can use the 5 volt regulator if you wish. Adjust VR4 to make the display read the known voltage. If you use the voltage from U3 as suggested, the display will read 05.0. You are now done with the calibration. Disconnect the leads to the known voltage source and connect them to the source you wish to measure.

If you would ever like to "touch up" the calibration of your Add-On Digital Voltmeter, remember to disconnect the jumper at TP1 and TP4 before you begin.

The Add-On Digital Voltmeter is intended to read DC-only voltages as built. **Be careful** working around the test points and with what you apply the input to. Some examples of possible uses would be your DC power supply in the shack, a battery charger, or a test meter for the adjustable supply.

Quantity	Name	Description
. 3		Common anode displays, 0.3*, left-hand decimal points, HP ≢5082-7610 or MAN3620A or equivalent
1	וט	CA3161E BCD-to-7-segment decoder
1	U2	CA3162E A/D converter
2		16-pin IC sockets
1	U3	LM340T5 +5 V regulator
3	Q1, Q2, Q3	2N3906 PNP transistors
2	D1, D2	1N4001 diodes
1	VR1	50k 10mm-style trimpot, Piher #PT10, horizontal (same for all trimmers)
1	VR2	10k 10mm-style trimpot
2	VR3, VR4	1k 10mm-style trimpot
1	R1	270 ohm 1/4 W resistor (all resistors carbon film 5%)
1	R2	2200 ohm 1/4 W resistor
1	R3	100k 1/4 W resistor
1	R4	680 ohm 1/4 W resistor
1	R5	100 ohm 1/4 W resistor
3	R6. R7, R8	4.7k 1/4 W resistor
1	CI	100 μF 25 V electrolytic capacitor
1	C2	10 μF 25 V electrolytic capacitor
1	С3	0.27 μF 50 V polyester PC- mount capacitor
1	C4	0.1 μF 50 V polyester PC- mount capacitor
4		1/2'-long wires, formed as shown in Fig. 2 (use clipped resistor leads)
1		PCB or perfboard. PCB available from Far Circuits, 18N640 Field Court, Dundee IL 60118-9269, \$2 per set of 2.
3		14-pin IC sockets for displays
1 1		Heatsink for regulator, Aavid #5971B used in model

Optional parts: Connector for input voltages to PCB; enclosure; hookup wirės; short length of ribbon-type cable. Parts can be obtained from a number of sources, including Jameco, Mouser, and Digl-Key.

Table 1. Parts list.

used during calibration — this makes finishing up your "Add-On Digital Voltmeter" easier. The test points are simply resistor leads with loops formed in one end, soldered into the PC board.

Constructing the "Add-On Digital Voltmeter" is very easy. The circuit

Simple P.S. Add-Ons

Enhance your next power supply project with an overvoltage protector and a smart LED output level indicator.

Whether you're a novice or seasoned veteran, one of the first home-brew projects you'll ever build is a power supply. It certainly is one of the most popular, and will find many uses in your DX shack. Perhaps you're building a supply from scratch, or refitting an existing supply with new updated electronics, but whatever the case, there are some important decisions to be made, such as output voltage and current handling capability. Just as important are other things that deserve attention, like overvoltage protection and output level indication, just to name two.

he first and most important circuit here deals with overvoltage protection, sometimes called OVP for short. This circuit protects the output of the supply from soaring dangerously high in the event that something goes wrong with the regulator. Should the circuit fail, you could wind up with the regulator input voltage at the output, and in most cases this is about 25 volts or more! With that much voltage going into any rig, I don't have to tell you what would happen — KAABOOM!

The next circuit is what I call a smart LED. This gives you an output level indicator when a voltage meter is not used. Having a single LED across the output is common on some power supplies, but all it tells you is that the supply is on. What it doesn't tell you is how much or at what level, and if you don't have enough voltage at the output you won't transmit at full power. Knowing what's going on under the hood of your power supply is always a good idea. Whatever your reason for using the smart LED, it will give you an accurate level indication, with a red/ green status from a single dual-color LED.

About the circuits

My original OVP circuit consisted of a zener diode, a couple of resistors, and an SCR. The idea was that if the output voltage would rise to 15.5 volts or more, the zener would gate on the SCR, crowbarring the output, and blowing the fuse. Now, this was simple and worked OK, but sometimes it would kill my output pass transistor when it crowbarred. Deciding that this was no fun. I came up with a more circuit-friendly design, illustrated by **Fig. 1.**

This circuit centers on an SN7404N hex inverter IC chip made of 6 inverters that, when put together, can form a latch-type circuit. The same circuit can be made with 3 or 4 transistors and at least a dozen or so resistors, but by using the IC chip, all these parts can be eliminated and a much simpler circuit can be built. Starting with **Fig. 1**, a sample of the output voltage is applied to point "A" at the cathode end of zener D1. When the voltage reaches 15.5 volts or more, D1 fires and places a high at

Continued on page 56

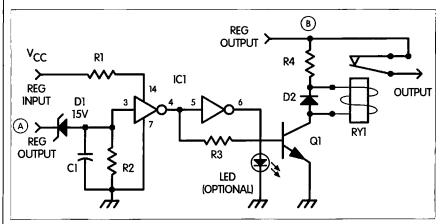


Fig. 1. Schematic for the OVP circuit and pinout for IC1.

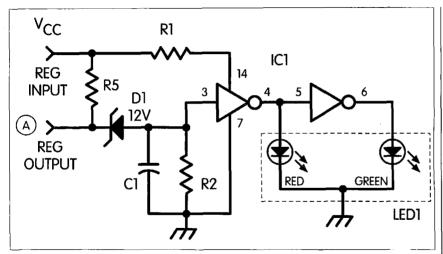


Fig. 2. Schematic for the smart LED circuit and pinout for IC1.

Simple P.S. Add-Ons continued from page 55

inverter.

pin 3, which is the input of the first

At this point, pin 4, the output of the same inverter, goes low, and the base drive for Q1, via R3, is cut off, shutting down the relay and disconnecting the output. R2 is the current limiter for the zener diode, and C1 bypasses any RF hash that might try to sneak in at the input, pin 3. VCC for the chip is supplied from the regulator input through R1. Beyond the IC, we have a basic off-the-shelf relay circuit. I selected R3 for the base circuit because the output on pin 4 goes to 3.8 volts when all is normal and the supply is not in OVP shutdown.

I didn't want a lot of voltage at the base of O1, but if you're curious, what we do have is 0.75 volts at the base when the zener fires, and this is perfect to turn on the transistor. VCC for the relay circuit is picked off at point "B" via R4, providing 10.8 volts to power the relay circuit, and even if the power supply goes into OVP shutdown. R4's value is enough to provide a safe operating level for the circuit.

You may have noticed that pins 4 and 5 are tied together. The output of the first inverter is connected to the input of the next inverter. This was done so that you could add a red LED from pin 6 to ground, to have an OVP indicator on the front panel of your power supply. The second inverter acts as a driver for the LED, and R1 drops enough voltage for the whole circuit so that no LED current limiter resistor is needed.

Fig. 2 illustrates the schematic for the smart LED — it too centers on an SN7404N chip. A sample of the output voltage is applied to point A at the junction of R5 and D1. When the voltage reaches 13 volts or more, D1 will fire, placing a high at pin 3 of the IC. Pins 4 and 5 will go low, turning off the red LED, and pin 6 will go high, turning on the green LED. Once again, R2 is the current limiter for D1, and C1 bypasses any RF hash at the input

Part Name	Description	Value	RS Part No.
D1	Zener diode	12 V 1 W	276-563
D1	Zener diode	15 V 1 W	276-564
D2	Diode	WEP-170	276- 1114
Q1	Transistor	2N2222 NPN	276- 1617
IC1	IC	SN7404N	276- 1802
R1	Resistor	680 ohm 2 W	
R2, R3	Resistor	1k 1/2 W	271- 1118
R4	Resistor	100 ohm 1/2 W	271- 1108
R5	Resistor	1.5k 1/2 W	271- 1120
C1	Capacitor	0.1 μF 50 V	272-135
LED1	LED red/green	Dual color	276-025
RY1	Relay	12 V 10 A	
PCB1	PC board	Dual IC	276- 159A
PCB2	PC board	Pre-etched	276-170

Table 1. Parts list.

pin 3. Also, VCC for the IC is supplied via R1 from the regulator input.

Somewhat of a voltage divider is formed by R5 in that it allows D1, a 12 volt zener, to fire a little above its rating (approximately 13 volts). The value of R5 was chosen to allow the circuit to operate at the output voltage of communication power supplies, but you can change its value and the value of D1 to monitor a wide variety for voltages and applications.

Construction

Construction of these circuits is relatively simple. If you're installing them into an existing power supply, they can be constructed on their own PC board, and then wired in. Or if there is enough room on an existing board, the circuits can be installed that way, eliminating the need to etch your own board. However, a lot of power supplies are built from scratch, and for the benefit of those who like to "roll their own," I have listed two pre-etched boards in **Table 1**, the parts list.

The first board listed can hold two



HamCall Mousepad, with morse code reference, 7.5" x 8", blue with yellow letters. \$5.00+\$3 shipping.

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The South Will Rise Again (in Your Back Yard)

Hy-Gain[®] has continued to develop the product line purchased from Telex in Nebraska in May of 1999. Randy Nash KC5NIS, Hy-Gain's antenna production specialist, says that now that the building has been expanded and its heavy-duty presses put in place, Hy-Gain of Mississippi can really get rolling.

Hy-Gain has already been producing the famous Hy-Gain antenna rotators, the entire VHF/UHF line, and many of the big beam antennas. "Now that the TH-7DX has been built, we will start on the TH-11DX, the Long Johns, and eventually the log periodic antennas," says Nash.

The new MFJ-269 covers 1.8 to 170 MHz plus 415-470 MHz! It can read SWR, complex RF impedance, resistance and reactance or magnitude and phase, coax cable loss (dB), coax cable length, distance to fault, return loss, reflection coefficient, inductance, capacitance, battery voltage, etc.

It has several new features above and beyond the usual popular MFJ ones. A built-in CoaxCalculator calculates coax line length in feet given coax length in electrical degrees, and vice versa, for any frequency and velocity factor (great for building matching sections and phasing lines). And a new 12-bit A/D converter gives much better accuracy and resolution than common 8-bit A/D converters.

The MFJ-269 reads complex impedance as series-equivalent resistance and reactance (Rs + jXs) or as magnitude (Z) and phase (degrees). It also reads parallel equivalent resistance and reactance (Rp + jXp).

With this SWR analyzer you can also measure SWR and loss of

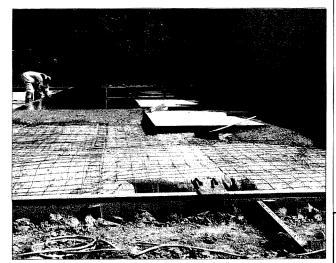


Photo A. Hy-Gain's expansion takes shape — or is this their new Rebar Ground Plane Grid?

coax with any characteristic impedance from 10 to over 600 ohms, including 50, 51, 52, 53, 73, 75, 93, 95, 300, 450 ohms, and more.

Be sure to look for more MFJ, Ameritron, Hy-Gain, Mirage, and Vectronics news, special features, and advertising in future issues of 73 Magazine.

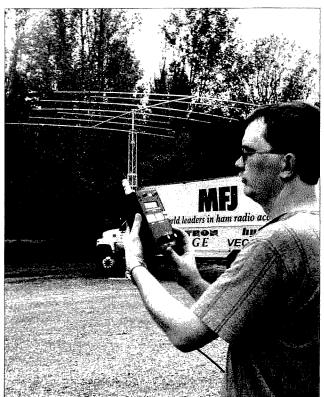


Photo B. Randy Nash KC5NIS, Hy-Gain's antenna production specialist, tunes and tests a new Mississippi-made TH-7DX Hy-Gain antenna with an MFJ-269 SWR Analyzer.

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ORX

continued from page 6

When Motorola first announced that it would abandon the system, some hams suggested asking that the company simply give the entire constellation to ham radio for educational and experimental purposes. Unfortunately, the idea never gathered much momentum, and whether a formal offer was made is not known.

Thanks to VHF Reflector, other news reports, via Newsline, Bill Pasternak WA6ITF, editor.

The Antimatter Matter

Scientists at Europe's premier high-energy physics laboratory announced that they might be about to crack one of the great puzzles of physics: Where has all the antimatter gone?

That's right, we said antimatter — as in the fuel used aboard the mythical starship *Enterprise* to seek out new worlds and new civilizations, and to boldly go where no one has gone before. At least on TV and in the movies.

But real-life scientists studying the origins of the universe believe that the Big Bang that created the cosmos 15 billion years ago should have produced equal amounts of matter and antimatter. They are baffled as to why there is more of matter than antimatter.

Now, the European Laboratory for Particle Physics just outside Geneva says it may have the answer soon. It announced that it would be able to study antimatter in depth for the first time with the help of the world's first antimatter trap that became operational a few weeks ago.

The machine, which cost \$11.5 million to build, is unique because it has the technology to slow down and trap antiprotons. These are the antimatter equivalent of the proton. It not only slows them down, but can actually hold them motionless, according to research spokesman Neil Calder.

Once they trap the antiprotons, the scientists will then throw in positrons, or the antimatter equivalent of electrons, in an effort to produce antihydrogen — the antimatter version of hydrogen, which is the simplest atom that exists.

Research scientists at the lab were able to create the first-ever atoms of antihydrogen — nine of them — in 1996, only to watch them disappear instantly after they came into contact with matter. And, unlike in the "Star Trek" story line, no gigantic explosion took place when the matter and antimatter joined. The anti-matter simply went away. (Or something like that. — ed.)

Thanks to Science Today, via Newsline, Bill Pasternak WA6ITF, editor.

ARRL Collecting Restrictive CC&R Tales

Attention, all ye antenna-challenged and otherwise persecuted: The League has begun compiling a dossier of the often difficult experiences of hams with homeowner covenants, con-

ditions, and restrictions. These are restrictions imposed by private homeowners' associations or by developers and are more often simply called CC&Rs.

The decision to investigate the effect of CC&Rs comes after the FCC turned down a request by the ARRL to reconsider the agency's denial of the League's request to extend the limited federal preemption known as PRB-1 to restrictive covenants. The League has said that it would like hams to be free to negotiate reasonable accommodation provisions with local homeowners' associations just as they do now with governmental land-use regulators. In declining last fall to act on the ARRL's initial request to expand PRB-1, the FCC drew the line at proposing specific rule changes to bring private restrictive covenants under the PRB-1 umbrella.

Since the FCC is standing by its decision to deny, the ARRL is inviting hams to send it accounts of how they have been denied the opportunity to install a tower or antenna on a home they own because of CC&Rs. The ARRL says that such narratives should relate directly to situations involving restrictive covenants and should be no longer than one page in length.

All submissions must include your name, callsign, the address at which you were denied the opportunity to put up an antenna, and the basis upon which you were denied. Also, include a copy of the contract language that would exclude your antenna or support structure and copies of any denial letters from a homeowners' association. Send this material to Antennas, c/o Steve Mansfield N1MZA at American Radio Relay League headquarters. Steve's address is 225 Main St, Newington CT 06111. E-mail submittals are welcome to smansfield@arrl.org with the subject line "antennas".

Thanks to David Black KB4KCH, via Newsline, Bill Pasternak WA6ITF, editor.

LETTERS

continued from page 8

I.M. Gottlieb W6HDM, Redwood City CA. An answer to a critic of my Aug. 73 ar-

CA. An answer to a critic of my Aug. 73 article, "Cold Fusion and Hot Speculations":

I find myself impressed with Mr. Ken Stone's analytical skills and his obvious proficiency with physics and with thermodynamics. However, without deliberately being obstinate, I continue to feel the presence of a mystery in the athletic performances of horses and migratory birds.

I am not refuting Mr. Stone's logic of energy conversion, but it seems to me that it applies to mechanical horses, not to biological horses.

The overlooked difference between these horses is that one of them, the animal variety, can be expected to be limited by muscular fatigue. The mechanical critter, on the other hand, is not hampered by this process of physical exhaustion.

In similar vein, the continual beating of the wings by the migratory bird bucking headwinds across the ocean should induce debilitating fatigue. I find it mysterious that some or most of such a flock makes the arduous journey. Even if insects are gobbled up in midflight, there must be something about animal metabolism that is not quite the way the texts have outlined it. (It is as if there were frictionless bearings connecting the wings to the bird's body.) Even if fueled by stored fat, why doesn't the bird tire?

Not withstanding this rebuttal to a rebuttal, I pledge my sincere effort to try to deal impartially with all viewpoints pertaining to the matter.

73 Tests the Drake SW1 Receiver

continued from page 21

there's a pretty good chance the current (when I bought mine) price of less than \$200 might drop even lower. So, don't just sit there — it's time to add a whole new dimension to your shack. Get with it, and start tuning around the shortwave broadcast frequencies. Remember, shortwave listening was the Internet before there was an Internet, a way for people to get to know people in strange, exotic, faraway places.

ON THE GO

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from a fixed location, but real hams do it while in motion. Then, of course, there's the interesting effect that overpasses, underpasses, passing trucks and general velocity have on both the transmitted and received signal. If there were ever the need for a new buzzword, it would be a special designation for mobile QSB.

The difference between an obstacle and a challenge is that a challenge has a reward that makes overcoming the obstacle worthwhile. Mobile operation provides a number of very tangible rewards. Getting the unit installed just right into the car is often a challenge, and once completed it is a beautiful sight to behold. Then, getting the antenna mounted so it's structurally sound AND resonant can be another distinct challenge. While all of these are achievable and the results can be satisfying to the technician or craftsman in each of us, I don't believe that is the whole answer.

Let's face it. The real satisfaction comes

from talking to a ham in Japan while on the road. It comes from having the DXpedition station return with "the mobile four only." It comes from talking to another stateside station that happens to be mobile over a thousand miles away. The real satisfaction comes from the fact that mobile HF operation is just plain fun.

Add-On Digital Voltmeter continued from page 54

can be laid out using perforated PC board, as was our first version, with copper on one side to solder our components. Or, a PC board set can be purchased — etched, ready to mount the components to, with a component silk-screen showing the layout of the parts. The purchased set includes two boards. One is for the separate display. which is nice because you will want to place this part in a window, to view it from. A clear plastic window or colored plastic display filter can be used to give the display a finished look. Either way is nice and, depending on your desires, you may decide to place everything on one board. Refer to the parts list for information on how to obtain the purchased set.

An interconnecting wire harness, or ribbon cable, can be used to connect the display portion of your project to the main PC board. Depending on your application, the desired length can be determined.

After assembly of the "Add-On Digital Voltmeter" is completed, you should double check your soldering, component layouts, and common construction faults. Be sure to use caution, when inserting the ICs in their sockets, to observe the correct locations of the number 1 pins. Refer to the Calibration Instructions to complete your project.

After calibration and installation of your "Add-On Digital Voltmeter," you can easily check the voltage you are measuring. The places you will find to use the "Add-On Digital Voltmeter" are limitless around the shack or workbench. I'm sure that you will find a nice use for this project, and enjoy building it as I have.

Simple P.S. Add-Ons

continued from page 56

DIP ICs or be broken in two, allowing two separate circuits to be constructed if one is all you want to build into your supply. The second board listed is more for constructing an entire power supply plus one or both circuits described here. This board has an upper and lower bus line and the foil pattern is laid out just like an experimenter's board, making it a lot easier to go from prototype to finished piece quickly. It's positively a nice way to go.

Once you've made your circuit board, wiring it in can be made much easier by using plug/jack wire assemblies. Basically, you have a plug made up of two or more wires and a jack that can be soldered onto your PC board. When the wires from the plug are soldered onto the corresponding areas of the power supply, just plug in your board and you're ready to go. The best source for these plug/jack assemblies is old discarded TV sets. Most TV

shops throw a lot of sets away, and you can find some that have a wide range of wire count and size. The best ones to get are the ones that have their pins IC-spaced, making it easier to mount on your PC board.

Some of you may be thinking about the relay in the OVP circuit, considering the fact that the contacts are always closed during operation, bearing the burden of full load. The one I chose has a 12 volt coil and contacts rated at 10 amps, so this should be more than enough to handle most applications. The resistor R1 is a 2

watt and should not be substituted for wattage or value. You can use a higher wattage, never lower; the value was selected for best operation and is a common one, so no changes are needed.

I mention these two parts because they are the only ones you won't find at the local parts emporium. Most of the parts listed in Table 1 can be found at your Radio Shack store or in a wellstocked junk box. The parts you can't find easily may be found at a TV repair shop. Stop in and get to know the owners. You may find you'll now have access to one of the biggest junk boxes in the world.

Final thoughts

Building and installing these circuits can be a lot of fun, and they are very useful. I know some people don't like to work with ICs that much, but these circuits are simple and can be put together in no time. The smart LED

Continued on page 61



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Steady As She Goes

High sunspot numbers will continue to cause erratic conditions throughout November. My calculations indicate generally (F)air conditions for the month, with some (P)oor and (G)ood days sprinkled about.

I don't foresee any spectacularly good or bad days during the period. Patient operators using good equipment will, of course, obtain the best worldwide results.

The first several days of November will be rather poor if the magnetic storm I predicted for late October develops. Other periods ripe for disturbance are the 6th-8th, 11th-13th, 17th-19th, and 27th-29th. The 17th and 18th have the most potential for severe solar activity, with detrimental effects possibly lasting several days. Happily, a strong ionosphere should recover quickly from most upsets and no total blackouts are expected.

Daytime signal degradation/absorption will increase as winter approaches, with the worst conditions occurring at midpath local noon, but nighttime propagation should continue to improve as the month progresses. As always, auroral echo and fading will be problematic on paths across the higher latitudes, as will atmospheric noise on the upper bands for paths across the hurricane belt and thunderstorm-rich tropics.

Band-by-Band summary

Daytime signal degradation/absorption typically *increases* during the winter months in the northern hemisphere primarily because the atmosphere gets colder and denser, allowing for a higher amount of ionization. The atmosphere also becomes shallower, which lowers the altitude of the ionized layers (especially F1 and F2), generally causing daytime skip distances to be shortened.

10-12 meters

Look for morning paths to Europe and Africa, midday paths to

	November 2000											
SUN	MON	TUE	WED	THU	FRI	SAT						
			1 F-P	2 F	3 F	4 F						
5 F-G	6 F-P	7 F-P	8 F	9 F-G	10 G	11 P						
12 F- P	13 F	14 F-G	15 G	16 G	17 P	18 F-P						
19 F-P	20 F- P	21 F	22 F	23 F-G	24 F-G	25 F-G						
26 G	27 F	28 F	29 F	30 F-G								

Table 1. November 2000 calendar.

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Central America	15 (40)	20 (40)	20 (40)	(40)	(40)	(20-40)	(15) 20	10-20	10 (20)	10-17	10 (20)	(10) 20
South America	(15) 20	20 (40)	20 (40)	20 (40)	¥	×	(15- 20)	т	(10)	10 (15)	16 (20)	(10) 20
Wastern Europe	40	40	40	40	(40)	×	(10-2G)	10 (20)	(10) 20	(15-20)	(20)	(20-10)
Southern Africa	(20-40)	(40)	×	×	×	×	×	(10-12)	10 (17)	(12) 17	(15-20)	20
Eastern Europe	(40)	(40)	×	×	(20)	x	(10-20)	(10) 20	(20)	×	×	x
Middle East	(40)	(40)	×	×	×	×	(10)	(10-15)	15 (20)	20	(20)	(20)
India/ Pakistan	×	×	×	×	×	x	×	(15-20)	×	×	×	(20)
Far Eust Japan	(15) 20	20	(20)	(20)	×	×	(20)	×	×	×	×	(10-20)
Southeast Asin	(15-20)	×	×	×	×	×	×	(10-20)	(10-15)	×	×	×
Australia	(10-17)	(15-20)	×	×	(20)	(30-40)	(20-40)	(10) 20	(10-20)	×	(20)	(10-15)
Alaska	15-17	20-30	×	×	×	20-30	20-30	15-17	15-17	x	,	15-17
Hawafi	(10) 15	(20)	20	(20)	20 (40)	40	(20-40)	(20)	(15-20)		(10)	10 (15)
Western USA	(10) 40	(15) 40	20-40	(20) 40	40	40	40	(20-40)	(10-20)	10-20	10-20	10-20

Centra: Arrerica	(15) 20	20 (40)	(20) 40	(20) 40	(20) 40	40	(40)	(10) 20	10-20	10-15	10 (20)	15-20
South America	(15) 20	20	20 (40)	20 (40)	(20)	,	*		(10)	10	10 (20)	(10) 20
Western Europs	(40)	40	40	(40)	×	¥	(20)	(15) 20	(10) 15	(15) 20	(20)	×
Southern Africa	20	(20)	*	×	×	×	×	×	(10-15)	(10) 15	15 (20)	50
Eastern Europa	×	(40)	×	×	×	.X	X:	(10) 20	(10-20)	×	×	×
Middle East	×	(40)	(50)	(20)	×	×	×	(10-15)	(10-15)	(20)	20	(20)
India/ Pakistan	×	(15)	×	×	×	×	(20)	×	(15)	×	×	×
Far EasV Japan	×	×	(20)	20	(20-40)	(40)	(20)	20	(15-20)	×	15	(15)
Southeast Asia	x	×	×	×	(29)	(20)	20	(15-20)	(15)	×	(15)	×
Australia	(10) 15	15	(15-20)	20	20 (40)	20-40	20 (40)	(2C)	×	×	×	(10-15)
Alaska	15-17	15-17	×	×	×	(40)	(40)	20	20	×	×	ХI

CENTRAL UNITED STATES TO:

			v	VESTE	HN UP	IITED	STATE	S TO:				
Central Amorica	(20-40)	40	40	40	(40)	×	(20)	(10) 20	10 (20)	10 (20)	(10) 20	(15) 20
South America	17 (40)	(20)	×	×	×	×	×	(75)	12 (20)	10-20	10-20	12 (40)
Western Europe	,x	×	(40)	(20)	(20).	×	(20)	(10-20)	(10) 20	(20)	×	×
Southern Africa	(20)	×	×	×	×	×	×	х	(10)	(15)	15 (20)	(15) 20
Eastarn Europa	×	x.	×	×	×	×	×	×	×	×	×	×
Middle East	(20)	(40)	(20)	20	20	(20)	×	(15)	(10) 15	(10-15)	(20)	(20)
india/ Pakistan	(15-20)	×	·x	×	×	×	×	(20)	×	×	х	×
For East/ Japan	(10) 20	(15-20)	,	×	(40)	40	(40)	×			(10-20)	:0-20
Southeast Assa	(15)	(20)	×	×	x	×	×	(20)	(15) 20	(20)	(10-15)	10-15
Australia	(10-15)	(15-20)	×	4	1	(2C-40)	(20-40)	20	(15-20)	15	(10-15)	10
Alaska	10-15	*	×	20-30	20-30	20-30	20-40	×	20	15	×	15-17
Hawaii	(15) 20	(15) 20	20	(20)	(40)	40	(20-40)	(15) 20	15 (20)	(10-15)	10 (15)	(10) 15
Eastorn USA	(10) 40	(15) 40	20-40	(20) 40	40	40	(20-40)	(10-20)	10-20	10-20	10-20	10-20

Table 2. November 2000 band, time, country chart. NOTES: 1. Plain numerals indicate bands that should be workable on Fair to Good (F-G) and Good (G) days. 2. Numbers in parentheses indicate bands usually workable on Good (G) days only. 3. Dual numbers indicate that the intervening bands should also be usable. When one number appears in parentheses, that end of the range will probably be open on Good (G) days only. 4. Be sure to check adjacent bands and times (±2 hours) for additional openings.

Central and South America, and afternoon paths to Japan. Australia, Asia, and the Pacific. Openings move west as the day progresses. A short-skip of 1,000 to 2,000 miles will be typical.

15-17 meters

Expect openings to many areas of the world, with good opportunities to Africa, South America, and the Pacific. Conditions often peak during local afternoon. Shortskip distances will be beyond 750 miles in the daytime and early evening.

20 meters

Good DX to most areas of the world opens from just after sunrise until midevening. Peaks are an hour or so after sunrise, again in the late afternoon, and before midnight, Expect a 500- to 1,000-mile shortskip during the day and 1,000 to 2,000 miles at night.

34/40 meters

Good worldwide openings can exist on (G)ood days. Daytime short-skip is limited to less than 1.000 miles, but nighttime skip will be in the 500- to 2,000-mile range. Noise levels can be quite high due to thunderstorms or hurricane activity.

80/160 meters

DX to Europe and the southern hemisphere can be observed after dark through local sunrise on (G)ood days, but will be limited by noise. As always, good activity on 40 meters indicates that the higher bands may be open, too. The gray-line path can be worked 30 minutes before until 30 minutes after local sunset. Daytime short-skip range is up to 500 miles. 500 to 2,000 miles can be expected at night.

Happy Thanksgiving!

Simple P.S. Add-Ons continued from page 59

circuit is an old design of mine that I have used for several applications over the past 10 years, and the circuit has performed flawlessly. The OVP circuit is a more recent design, but it too has worked perfectly and will be installed in every power supply I build.

I can't stress enough the importance of installing an OVP circuit in any power supply you build. Also, if you buy one, check to see that it has an

OVP circuit. If not, install one, and you'll be glad you did.

NEUER SAY DIE

continued from page 4

briefly introduced me and asked why 1 thought NASA faked the Moon landings, which he said he was totally convinced had really happened. This topic wasn't on the outline. Stan had read the list of the books I've written, which included Moondoggle, a book which explains how I became convinced that NASA had faked all of the Apollo Moon landings.

Stan's game was clear. He thought he'd be able to discredit me as a conspiracy nut to get even with me for complaining about him. So I explained some of the reasons that the Moon landings could never have happened. Then we went to commercials. At the end of the commercials they had a caller who insisted on being heard, saying that he wanted to rebut me. Stan was, of course, delighted to put him on.

It was a caller from Louisiana who said he had worked on the LEM for General Dynamics and that not one person at General Dynamics believed for a minute that we'd ever really been to the Moon. They knew that the LEM was a fake, and that their engineers had never been able to get it to fly.

Stan was dumbstruck. By then the hour was over. So much for my hosting the show. Phooey.

These two turkeys seem to think they are Click and Clack, the Tappet Brothers. They're not.

Numbers

The recent move by the FCC to force us to give them our social security numbers, which, as far as I know (which is fairly far), has no legal basis, is another move to replace our individual names with numbers.

If you stop to think about it, which few people have, our whole school system, which kids are forced by law to endure, is aimed at robbing us of our individuality and forcing us to be as much alike as possible. There is no room for individuality. We all have to take the same courses at the same time, and those who ask too many questions are humiliated and embarrassed into shutting up. The whole class moves along at the speed of the slowest children, no matter how boring this is for the brighter kids. I used to bring tiny colored beads in and make bead rings and bracelets during classes. Or sketch rocket ships.

Everyone is taught to the tests, not to increase their understanding of the world and their possible roles in it.

The textbooks are dreadful, further ensuring that the children will be bored stiff. Homework consists almost entirely of short-term memorizing irrelevant stuff for a coming test.

The whole system has been intentionally designed to produce workers who will do what they are told and not ask questions. Our larger business organizations, the military, and government all reward those who make no waves and blackball those who are creative.

Be born, go to day care, and watch Sesame Street, go to public school and learn, sort of, to read. Then pass tests of your short-term memory for a few years. This goes on through college and advanced degrees. Then you get a job, do as little as you can and stay employed, ask no questions, volunteer no ideas, and get your yearly wage increases, mainly through seniority.

This system used to result in your getting a gold watch and a modest retirement pension, which almost was enough to pay your nursing home and funeral costs. Now companies have wised up and lay you off before the pension costs escalate for them. And that leaves you making do with a Social Security check. Good luck.

My friends, we are the golden goose. We are paying Congress and the government to make sure this system stays intact. It's a gravy train for Congress maybe you've noticed that politicians will spend millions to get or keep their Congressional seats. And hundreds of

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millions to be in the White House. That's your money they're spending, goosey.

What can you do? You can help break the gravy train tracks by encouraging Sudbury Valley type schools to be opened in your area and sending your kids to a school where they will be treated as individuals — where there are no tests, no homework, no grades, and not even any fixed curriculum. And yes, their system works — beautifully. Read any of the eight books about this school. Some are reviewed in my Secret Guide to Wisdom.

My Secret Guide to Wealth will help wise you up so you can kick the "job" habit and get started with your own company. That's where freedom lies.

Meanwhile, we are kept entertained by ball games, a hundred TV channels, and RVs — just as the Romans were entertained by the games while their civilization was crumbling through corruption.

When the FCC demands your Social Security number, tell 'em I said they have no legal right to it.

42 Countries!

Is it really necessary for us to keep troops in 42 countries? At a cost of billions? Talk about featherbedding! Who are our troops in Japan, Germany, France, and so on protecting?

Considering the incredibly wasteful way the military spends their budgets, how wise are the calls by Bore and Gush to increase military spending? How big an army do we need to be able to deal with any conceivable coming military needs? Where's the threat?

It didn't take a million men to deal with Saddam. Perhaps, if we had more intelligent military leaders and fewer politicians butting in (yes, I mean you, Bubba), we could stop filling warehouses with unused, outmoded military supplies.

Let's see, since the collapse of the Rusty Curtain, we've sent troops to Somalia, Haiti, Panama, Grenada, and Kosovo. And we bombed an innocent Sudan pharmaceutical factory, plus a Chinese embassy. Oops! So solly.

Yes, there are some rogue countries we need to be wary of, but not from their attacking us directly. The threats today are from smuggled nukes or biological terrorism attacks — and those have to do with the FBI, CIA, NSA, DIA, and so on through the many covert agencies, few of which seem to be able to cooperate with each other, or with the military.

Butts and Guts

If you've walked around a shopping mall or watched shoppers in supermarkets, you've seen the same sights I have: women with great big fat butts and men with great big fat guts. It is, of course, insulting to point out to them what grotesque shapes they've eaten their bodies into. Or that fat is ugly.

I'd like to tell these poor unfortunate people how easy it is to lose weight. A change to raw food will do it. They have to stop eating refined sugar and drinking diet drinks. The bioelectrifier helps, too. I've gotten excited calls almost daily from people using it who tell me about how much weight they've lost. That little gadget is working miracles for hundreds of people who've built or bought 'em.

Fat shortens your life, and it helps make you sick.

If you've lost the back issues of 73 with the bioelectrifier construction articles, you can order my *Bioelectrifier Handbook* from Radio Bookshop.

Stupidity

Yes, I understand how addictive cigarettes are. Almost every older person who still smokes wishes to hell they could stop. But how can we get the message to the Joe Camel- or Marlboro hemen-influenced kids who think smoking is cool?

When I see kids smoking, I don't think they're cool — I know they've got to be really big-time stupid. How dumb to take on an expensive lifetime addiction that is guaranteed to shorten their lives.

I thought about this as I read a recent UC-Berkeley Wellness Letter which said that 90% of all lung cancer cases are caused by cigarette smoking — and that there is no way to detect lung cancer early enough to cure it. The five-year survival rate at diagnosis is less than 13%. Further, chest x-rays have been proven not to save lives.

And that doesn't count the lives lost to emphysema, heart attacks, pneumonia, and the ills a nicotine-depressed immune system helps exacerbate — like cancer.

We made a great big fuss over 58,000 Americans getting killed in Vietnam over the several years of that war, but we ignore the 400,000 smoking-related deaths every year.

How can you help? By making a nuisance of yourself and telling every teenager you see smoking that it isn't cool—it's just clear proof of incredible stupidity.

The Fourth

When I was a kid, my dad and I would go down to the local grocery and buy fireworks. I had a great time setting off cherry bombs, firecrackers, and 4-inch salutes. At night, we'd shoot off a few small rockets. Later, there were memorable fireworks displays at the 1940 World's Fair, and in the '50s every

Wednesday night at Coney Island — where I'd take some friends out on my Chris Craft cruiser and we'd anchor near the fireworks barge so we could see 'em up close.

But, the most remarkable displays I've ever seen were those put on at the Jaffrey NH airport by Jaffrey's Atlas Fireworks Company to show their new products to potential big buyers. They are the most awe inspiring displays I've ever seen.

But, you know, there are only three Fourth of Julys that really stand out in my memory. The first was in 1944, when my submarine pulled into the harbor at Fais Island and we destroyed a Japanese phosphate plant with our 5-inch deck gun. We blew it to smithereens. I was in the conning tower, watching the shells on my radar screen, and telling the gun crew exactly how many yards they were off the target, long or short, right or left.

The next memorable Fourth was in 1976, when Sherry and I were visiting Madrid's zoo, where Sherry got bitten by a baby tiger. I missed the photo op, so I had her do it again on camera.

Then there was the 2000 Fourth, where I did my first sky dive. They take you up to 14,000 feet, where you roll out of the plane. You free fall for a minute, which seems more like five seconds, and then parachute the rest of the way down to a gentle landing. Hey, that's addictive!

Self-CPR

According to Dr. Day, the first warning 60% of heart attack victims have of any problem is death. My cousin, who was quite a bit younger than me, keeled over last year at the dining room table. His wife had refused to take a CPR course, so she had no clue as to what to do to save him.

If you are alone, or have a spouse who is revulsed by the idea of giving someone mouth-to-mouth respiration, here's what you can do to keep from becoming an instant statistic. Of course, a better bet would have been for you to have read my Secret Guide to Health and followed my instructions, in which case you wouldn't be in that fix. But, you saved the \$5, probably figuring, What the hell does Wayne know?

Okay, here's the pitch. When you begin to feel faint, you'll have about ten seconds left before you lose consciousness — and probably five more seconds before an IRS agent is dispatched to assess your estate taxes. You can stave off the tax man by coughing vigorously and repeatedly, taking a really deep breath before each long cough. Cough from deep in your chest. Repeat this every

Continued on page 64

Here are some of my books which can change your life (if you'll let 'em). If the idea of being healthy, wealthy and wise interests you, start reading. Yes, you can be all that, but only when you know the secrets which I've spent a lifetime uncover-

.....Wayne

The Bioelectrifier Handbook: This explains how to build or buy (\$155) a little electrical gadget that can help clean the blood of any virus, microbe, parasite, fungus or yeast. The process was discovered by scientists at the Albert Einstein College of Medicine, quickly patented, and hushed up. It's curing AIDS, hepatitis C, and a bunch of other serious illnesses. The circuit can be built for under \$20 from the instructions in the book, \$10 (#01)

The Secret Guide to Wisdom: This is a review of around a hundred books that will help you change your life. No. I don't sell these books. They're on a wide range of subjects and will help to make you a very interesting person. Wait'll you see some of the gems you've missed reading. \$5 (#02)

The Secret Guide to Wealth: Just as with health, you'll find that you have been brainwashed by "the system" into a pattern of life that will keep you from ever making much money and having the freedom to travel and do what you want, I explain how anyone can get a dream job with no college, no résumé, and even without any experience. I explain how you can get someone to happily pay you to learn what you need to know to start your own business. \$5 (#03)

The Secret Guide to Health: Yes, there really is a secret to regaining your health and adding 30 to 60 years of healthy living to your life. The answer is simple, but it means making some difficult lifestyle changes. Will you be skiing the slopes of Aspen with me when you're 90 or doddering around a nursing home? Or pushing up daisies? No. I'm not selling any health products. \$5 (#04)

My WWII Submarine Adventures: Yes, I spent from 1943-1945 on a submarine, right in the middle of the war with Japan. We almost got sunk several times, and twice I was in the right place at the right time to save the boat. What's it really like to be depth charged? And what's the daily life aboard a submarine like? How about the Amelia Earhart inside story?If you're near Mobile, please visit the Drum. \$5 (#10)

Wayne's Caribbean Adventures: My super budget travel stories - where 1

visit the hams and scuba dive most of the islands of the Caribbean. You'll love the special Liat fare which let me visit 11 countries in 21 days, diving all but one of the islands. Guadeloupe. where the hams kept me too busy with parties. \$5 (#12)

Cold Fusion Overview: This is both a brief history of cold fusion, which I predict will be one of the largest industries in the world in the 21st century, plus a simple explanation of how and why it works. This new field is going to generate a whole new bunch of billionaires, just as the personal computer industry did. \$5 (#20)

Cold Fusion Journal: They laughed when I predicted the PC industry growth in 1975. PCs are now the third largest industry in the world. The cold fusion ground floor is still wide open, but then that might mean giving up watching ball games. Sample: \$10 (#22). Julian Schwinger: A Nobel laureate's talk about cold fusion-confirming its validity. \$2 (#24)

Improving State Government: Here are 24 ways that state governments can cut expenses enormously, while providing far better service. I explain how any government bureau or department can be gotten to cut it's expenses by at least 50% in three years and do it cooperatively and enthusiastically. I explain how, by applying a new technology, the state can make it possible to provide all needed services without having to levy any taxes at all! Read the book, run for your legislature, and let's get busy making this country work like its founders wanted it to. Don't leave this for "someone else" to do. \$5

Mankind's Extinction Predictions: If any one of the experts who have written books predicting a soon-to-come catastrophe which will virtually wipe most of us out are right, we're in trouble. In this book I explain about the various disaster scenarios, like Nostradamus, who says the poles will soon shift (as they have several times in the past), wiping out 97% of mankind. Okay, so he's made a long string of past lucky guesses. The worst part of these predictions is the accuracy record of some of the experts. Will it be a pole shift, a new ice age, a massive solar flare, a comet or asteroid, a bioterrorist attack? I'm getting ready, how about you? \$5 (#31)

Moondoggle: After reading René's book, NASA Mooned America, I read everything I could find on our Moon landings. I watched the videos, looked carefully at the photos, read the astronaut's biographies, and talked with some of my readers who worked for NASA. This book cites 25 good reasons I believe the whole Apollo program had to have been faked. \$5 (#32)

Classical Music Guide: A list of 100 CDs which will provide you with an outstanding collection of the finest classical music ever written. This is Allow-4 weeks for delivery except fureign, though we try to get most orders shipped in a day or two.

what you need to help you reduce stress. Classical music also raises youngster's IQs, helps plants grow faster, and will make you healthier. Just wait'll you hear some of Gotschalk's fabulous music! \$5 (#33)

The Radar Coverup: Is police radar dangerous? Ross Adey K6UI, a world authority, confirms the dangers of radio and magnetic fields, \$3 (#34)

Three Gatto Talks: A prize-winning teacher explains what's wrong with American schools and why our kids are not being educated. Why are Swedish youngsters, who start school at 7 years of age, leaving our kids in the dust? Our kids are intentionally being dumbed down by our school system - the least effective and most expensive in the world, \$5 (#35)

Aspartame: a.k.a. NutraSweet, the stuff in diet drinks, etc., can cause all kinds of serious health problems. Multiple sclerosis, for one. Read all about it, two pamphlets for a buck. (#38)

One Hour CW: Using this sneaky booklet even you can learn the Morse Code in one hour and pass that dumb 5wpm HF entry test. \$5 (#40)

Code Tape (T5): This tape will teach you the letters, numbers and punctuation you need to know if you are going on to learn the code at 13 or 20 wpm. \$5 (#41) Code Tape (T13): Once you know the code for the letters (#41) you can go immediately to copying 13 wpm (using my system). This should only take a couple of days. \$5 (#42)

Code Tape (T20): Or, you can start right out at 20 wpm and master it in a weekend. \$5 (#43)

Wayne Un-Dayton Talk: This is a 90minute tape of the talk I'd have given at the Dayton, if invited. \$5 (#50)

Wayne Tampa Talk: This is the talk I gave at the Tampa Global Sciences conference-where I cover amateur radio, cold fusion, health, books you should read, and so on, \$5 (#51)

\$1 Million Sales Video: The secret of how you can generate an extra million dollars in sales just by using PR. This will be one of the best investments you

Reprints of My Editorials from 73. Very few things in this world are as we've been taught, and as they appear. I blow the whistle on the scams around us, such as the health care, our school system., our money, the drug war, a college education. sugar, the food giants, our unhealthy food, fluorides. EMFs, NutraSweet, etc.

1996 Editorials: 120 pages, 100 choice editorials, \$10 (#72)

1997 Editorials: 148 fun-packed pages. 216 editorials, \$10 (#74)

1998 Editorials: 168 pages that'll give you lots of controversial things to talk about on the air. \$10 (#75)

1999 Editorials: 132 pages of ideas, book reviews, health, education, and anything else I think you ought to know about, \$10 (#76)

2000 Editorials: In the works.

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Wayne's Bell Saver Kit. The cable and instructions enabling you to inexpensively tape Art Bell W6OBB's nightly 5-hr radio talk show. \$5 (#83) NH Reform Party Keynote Speech. It wow'd 'em when I laid out plans for NH in 2020, with much better, vet lower-cost schools, zero state taxes, far better health care, a more responsive state government, etc. \$1 (#85)

Stuff I didn't write, but you need: NASA Mooned America: René makes an air-tight case that NASA faked the Moon landings. This book will convince even you. \$25 (#90)

Last Skeptic of Science: This is René's book where he debunks a bunch of accepted scientific beliefs - such as the ice ages, the Earth being a magnet, the Moon causing the tides, and etc. \$25

Dark Moon: 568 pages of carefully researched proof that the Apollo Moon landings were a hoax—a capping blow

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Send your ads and payment to: 73 Magazine, Barter 'n' Buy, 70 Hancock Rd., Peterborough NH 03458 and get set for the phone calls. The deadline for the February 2001 classified ad section is December 10, 2000.

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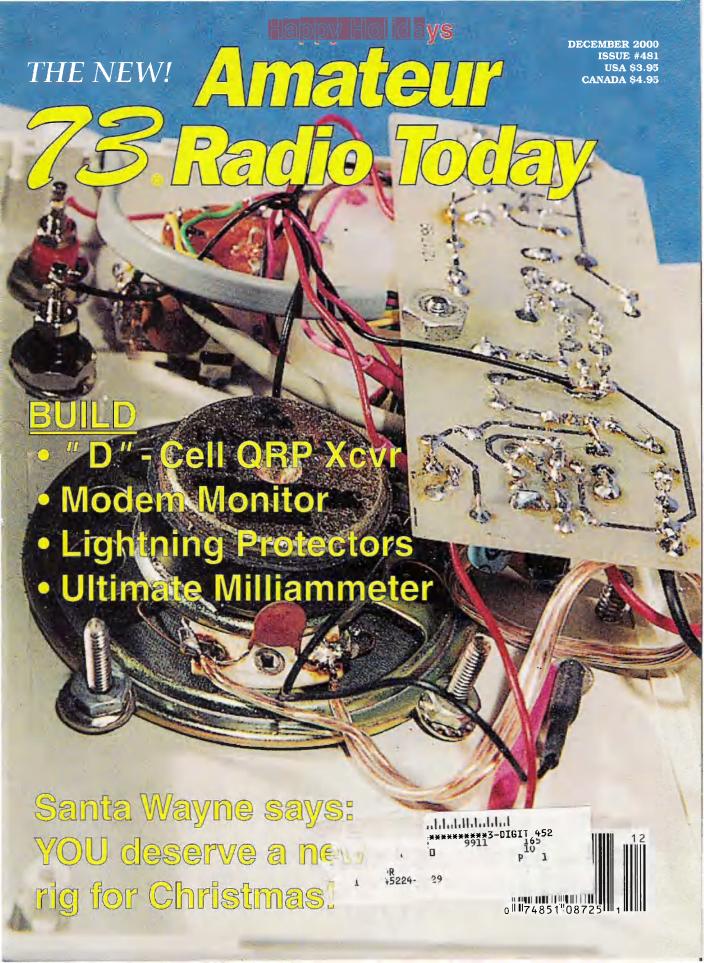
two seconds until help arrives in the form of someone with CPR experience, or your heart resumes normal beating.

The deep breathing will bring oxygen into your lungs and the coughing squeezes the heart, keeping the blood circulating, and encouraging the heart to regain its normal rhythm. This should give you enough time to get to a phone to call for

Maybe after you survive that notice from your body that you've been mistreating it, you'll finally read my book. Heart attacks are totally caused by what you've been doing to your body. If you continue to punish it, your number is going to come up. 73

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THE NEW! 75 Amateur Radio Today

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Hams and Affirmative Action

Several predicted it would happen. Now a call for more minorities to be ushered into ham radio is growing on the Internet and on the air in some Eastern localities. This, as a growing number of ham radio activists are demanding that the government enact an affirmative action policy geared at bringing more minorities, females, and people of color to the ham radio bands.

Those promoting the idea say that you need only attend any ham club meeting to see that all minority groups are grossly under-represented in the hobby. They cite the growing electronic divide in the percentage of white versus black households who have Internet access. They say that this same chasm exists in

amateur radio but only more so. And they also say that the only way to bring racial and gender equality to ham radio is to actively recruit minority peoples and, if necessary, waive the examination process.

Those who oppose such an Affirmative Action program cite the fact that proponents would first have to prove persistent and pervasive past discrimination in order to justify special requirements. They point out that there is a finite legal definition of discrimination and that a group being under-represented in an activity of its own accord is not necessarily suffering discrimination. They also point out that discrimination means being excluded on the basis of race, creed, color, gender, or national origin

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NEUER SRY DIE

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Traffic Tickets

How would you like to know a way to avoid getting any points on your license the next time you get a traffic ticket? Here's how you can take advantage of the computerized traffic ticket systems they are using in every state. This information supposedly comes from someone who works for the computer company that sets up the database for the motor vehicle departments.

Here's how you work it. When you get your fine, send a check to pay for it. But (love those buts), instead of paying the actual fine, send the check for a few dollars more than the fine. The system will then have to send you a check for the difference. Do not, heh-heh, cash that refund check. Shred it, or have it framed, but do not cash it.

Since points are not assessed on your license until all financial transactions are complete, you'll beat the system, which has gotten its money, so it won't bother you anymore.

There, has that paid for your subscription to 73 for next year?

Executive Order

I understand that Clinton signed an Executive Order on 9/30/00 to the effect that the military now has the right to give any member of the armed forces any inoculation, any time, and at any place. This has the force of law.

This, I suspect, has to do with several of our military refusing to be inoculated with the anthrax vaccine. 60 Minutes had a segment about an officer who refused the vaccine and was discharged as a result.

Considering the quantity of medical complaints from people who have had the vaccine and suffered sometimes drastic consequences, as reported on the Coast-To-Coast show by Joyce Riley, with a growing number of their babies being seriously deformed, there has to be a lot going on here that we aren't hearing about.

On my last interview on the show, I suggested that some sort of mass immunization program for anthrax was the only logical explanation I could think of to explain this smothering of our whole country with those mysterious chem trails. Or have you looked up lately?

I cited Bioterrorism, a book I've reviewed in my Secret Guide to Wisdom which makes a very good case for Iraqi groups all around America brewing anthrax to be sprayed in our major cities and from cropdusting planes in rural areas. The book says that leaks from some CIA-infiltrated Iraqi cells claim that their aim is to kill around 200 million Americans within a few days in retaliation for their defeat in the Gulf War.

Is this just another conspiracy theory? Well, it's a practical and relatively inexpensive way to attack us, so it makes a lot of sense from that viewpoint.

The CIA, NSA, FBI, DIA, and the eight other federal secret agencies, undoubtedly know about this, but don't have any way to be sure of stopping all terrorist cells. If they announced a confirmation of the situation, there could be one heck of a panic as the pub-



shots, which are in relatively short supply. Plus, the serious side effects of the shots could then trigger millions of malpractice suits. A more gentle spraying of an immunizing agent over the country might help protect us from being killed by an anthrax attack, merely making us awfully sick instead of dead.

I discussed this idea on the Coast-To-Coast program in early June and got quite a few letters agreeing with-my assessment. No one challenged it.

By the way, Bioterrorism lists places where you can get protective clothing and masks. Y'know, if something like this is launched at the next Ramadan holy holiday, it could gut every communications system except amateur radio. If they are able to kill or disable half of the people in the country, it sure would create a mess.

AIDS

On the subject of bioterrorism, a couple of the books I review in my Secret Guide to Wisdom make very good cases for the AIDS epidemic being spread intentionally to certain groups. Like Africans and homosexuals. I suppose those responsible might look on that as one way to stem the African population explosion.

I've corresponded with some of the authorities in South Africa about this, explaining that I'm convinced that AIDS can be cured, and without any expensive medications. The same simple, inexpensive aplic demanded anthrax vaccine | proach that works for cancer

and other serious illnesses, as covered in my Secret Guide to Health, should take care of AIDS, no matter how it is spread. This, apparently, wasn't what they wanted to hear. Well, there's no money in it if people don't need hospitalization and drugs.

Reversals

If you're not a Coast-To-Coast listener, you missed all those programs Art had with the guy who discovered that people tend to give themselves away when you play a tape of their talk in reverse.

The whole idea is ridiculous, of course. Except that he was able to come up with some surprisingly clear tape reversals which put a lie to what people were saying.

Anyway, I got an E-mail from Joe Egles K2UX, who has been reversing some of our astronauts and NASA. He has one of Buzz Aldrin saying, "Man was not here," and a mission controller saying, "Apollo a lie from its onset ... I'll tell about you ... I'll tell ... no mission at all." Joe's thinking in terms of a book with a CD of the reversals.

Or do you still prefer to think Wayne is crazy for doubting our going to the Moon? Only if you haven't bothered to do your homework. By the time you've finished the 568-page Dark Moon book, you'll be as convinced as I. Yes, I have some copies available. \$40, including priority mail from Radio Bookshop. Hardbound copies

Continued on page 6

NEUER SAY DIE

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are \$50. For a little extra you can go first class in life.

Epilepsy

Some time ago, I mentioned that a TV exposé show had a segment explaining that many years ago doctors at the Johns Hopkins hospital discovered a special dietary cure for epilepsy—and buried it. Except for the persistence of one woman doctor, this cure might have been lost.

One of my readers, Diane Miller of Hilo HI, sent an update that you should note if you know of anyone with a child with epilepsy. You can get the info on this by going to [www.hopkinsmedicine.org] and searching for "ketogenic diet" in the Search Box.

Progress?

What would you think of a person who held up a medical book from the 1700s, claiming

that its teachings are the whole truth? That all doctors today should follow its teachings?

Or the person who points to a math book written in 1536 as the last word in math? Or someone who claims that a book on physics published in 1858 is what we should all believe? Or an electronics text from 1928 as the end-all book on the subject?

Ridiculous, of course. Yet, when it comes to spiritual matters, the so-called experts in the field are asking us to take as fact books that were published 1,500 to 2,500 years ago as the latest words on the subject. How can we honestly believe that in 2,000 years we haven't made *any* progress at all in our understanding of our spiritual side?

We've gone from smoke signals and the Pony Express to the Internet. From dead reckoning navigation to global positioning satellites that tell us within a few feet where we are anywhere in the world. However, in spiritual matters the whole world seems unable to recognize or acknowledge anything we've learned in the last thousand years or so, much less the last hundred years, when every other field of knowledge has been accelerating, making the texts of just a few years ago obsolete.

The resistance to new information in the spiritual field is as strong (stronger, actually) as that in the other fields. Like Galileo and Copernicus in astronomy. Like Semmelwise and Pasteur in medicine. Like the reality of meteors and plate tectonics. Like the blind eye many of today's leading physicists have turned to the cold fusion phenomenon.

In spiritual matters, our "spiritual leaders" have ignored all developments not cited in their 2,000-year-old textbooks. Reincarnation? Heck, they edited that out of the Bible 1,500 years ago. Communicating with the spirits of the departed? Mere superstition. In the medical field, any uncomfortable new ideas are

immediately called snake oil or quackery by the medical establishment.

Having regressed many people to their past lives, I don't have to depend entirely on the many very well documented books on the subject to accept the reality. In reading about the carefully documented scientific experiments with telepathy, precognition, psychokinesis, and so on by Dr. Rhine at Duke University 50 years ago, and the recent Princeton PEAR Labs, how can I reject this reality if I have an even partially open mind?

Anyone whose mind isn't clamped shut by religious beliefs will find that there have been a lot of interesting developments in the spiritual field.

Read some of the mind-expanding books by Boone, Crookall, Radin, Graff, Monroe, Moody, Bird, Bander, Alexandersson, Stone, Kubris, Lehto, Stephens, Jaegers,

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continued from page 1

and not because they cannot or do not want to pass a federally administered exam.

But those pushing such an Affirmative Action program counter by saying numerical goals for admission to Amateur Radio are for more important than maintaining what they call artificial barriers to the hobby that are created by the federally mandated entrance examinations. They say that it's far more meaningful to fully integrate the Amateur Radio hobby, which they claim is traditionally closed to minorities because of discrimination on the part of an elderly, male-dominated majority.

Thanks to Tuck Miller NZ6T, via Newsline, Bill Pasternak WA6ITF, editor.

Lambda vs. ARRL vs. BSA?

The Lambda Amateur Radio Club wants the American Radio Relay League to sever ties with the Boy Scouts of America. This, over what Lambda says is the Scouts' policy of discriminating against gays.

The Lambda Amateur Radio Club is an organization composed primarily of gay and lesbian radio amateurs. In an open letter from its president, Art Joly N1RPN, to League president Jim Haynie W5JBP, Lambda requested that the ARRL officially and publicly distance itself from the Boy Scouts of America because of the organization's policy to dismiss and exclude gay Scouts and Scoutmasters.

Haynie informed his counterpart in the Lambda Amateur Radio Club that the League will not drop its ties to the Boy Scouts of America, despite Lambda's claim of discrimination against the gay community by the scouting organization.

As expected, the ARRL did not issue a public response. Instead, Lambda chose to make Haynie's private response public, as quoted by Lambda spokesperson Jim Kelly KK3K. Said Haynie:

"I would suggest to you that it is unnecessary for the ARRL to take any position on subjects that do not pertain specifically to Amateur Radio. It would be beyond the scope of the League's charter to address political topics unrelated to its mission and purpose."

The letter came only days before this past fall's Scout Jamboree on the Air, or JOTA. The ARRL is a long-time, highly visible supporter of the United States Scouting movement, and has very close ties to the Boy Scouts in particular. As such, nobody expected it to give in to the Lambda call for it to sever its ties.

Thanks to the Lambda ARC (press release) and www.rainreport.com, via Newsline, Bill Pasternak WA6ITF.

MURS: Another CB-like Challenge?

With little fanfare, the FCC created the Multi-Use Radio Service on July 12th. Its birth went just about unnoticed by everyone except those in the telecommunications industry who had fought long and hard to see it become a reality. And its reality is that it is another hobbylike radio service that could be in competition with ham radio for users.

MURS is really a new kind of license-free Citizens Radio Service, but one not subject to the vagaries of high frequency propagation. This is because MURS operates in the 151 MHz spectrum — not far above the two-meter ham radio band. But unlike 2 meters, the MURS service is expected to be filled by everyone from hobbyists to commercial users, all vying for local communications access that is virtually regulation-free.

Unlike its predecessor, the micropower Family Radio Service in the 460 MHz band, MURS permits users to run up to 2 watts of effective radiated power. There is no restriction on connecting external antennas to a MURS radio, as long as the 2 watt effective radiated power restriction is observed. Also permitted will be phone patching, paging, telemetry, and remote control operation. In addition to voice, the FCC is permitting MURS users to transmit packet, data, and imaging.

Does MURS sound like a clone of the VHF and UHF Amateur Radio service? Well it takes it a step beyond because there is no restriction on the content of communications in the Multi-Use Radio Service. Also, repeaters will be permitted, extending the range of communications across an entire region.

But there are a couple of negatives. First, there are only five MURS channels. They are at 151.82, 151.88, 151.94, 154.57, and 154.60 MHz. The first three are listed as having an 11.25 kHz bandwidth, while the last two permit a 12.5 kHz-wide signal. Also, continuous transmissions are permitted on four of the five MURS channels, which is bound to cause havoc with those attempting to share with voice and other modes.

So what will the impact of MURS be on ham radio? First, it will interest kids who want to connect their computers to the Internet so that they can constantly be on-line. It will probably also siphon off those adults who have been considering becoming radio amateurs but do not want to take the time to learn the theory, rules, and regulations. (No formal license is required tor MURS.) This is almost a parallel to those who fought to create a code-free amateur license because they did not want to learn the Morse. And as we saw from ham radio's experience with no-code licensing, those numbers can be staggering.

MURS was scheduled to have begun last

November 13. We hope our readers will keep us updated on developments in their area ...

Thanks to Bill Burnett KT4SB, via Newsline, Bill Pasternak WA6ITF, editor.

Airliner Ban Continues

If you have any thoughts of using your twometer handheld or a cellular phone the next time you fly on a commercial airliner in the United States — forget it. A recent decision makes it look like the decade-old ban on the use of these devices and others will continue.

The decision lets airlines continue restricting inflight use of electronic devices. It comes after telecommunications experts told Congress that — while there is no definitive proof that cellular phones pose safety risks on airplanes — the devices should stay banned as a precautionary measure.

The Federal Aviation Administration's Thomas McSweeny testified that restricting the use of these devices prevents a disaster with an extremely remote chance of happening from taking place.

McSweeny's testimony took place before the House of Representatives Transportation Subcommittee. The hearing was held because lawmakers say the public is confused about airline rules governing use of devices including laptop computers, hand-held games, pagers, 2-way radios, and cellular phones.

Tennessee representative John Duncan says the ban against cellular phones in the air is one of the biggest causes of altercations between passengers and crew on board airplanes.

McSweeny says that the FAA remains concerned that radiation from electronic devices could cause errors in the aircraft instrument landing systems or global positioning readings. He notes that many hospitals prohibit using cellular phones and other transmitters because they can interfere with health monitoring devices.

But other witnesses testified that while there have been incidents in which portable electronic devices may have interfered with aircraft operations, they have never been able to repeat such episodes under controlled conditions.

The FCC's engineering and technology chief, Dale Hatfield WØIFO, also testified. Hatfield says that Commission rules also prohibit cellular transmissions aboard in-flight aircraft. That, he says, is because calls made from high altitudes keep phones on the ground from being able to use the same cellular telephone base station frequencies.

Representative James McGovern urged the FAA to promote technology which detects emissions from inside an aircraft cabin that could produce electromagnetic interference. That kind of technology, McGovern says, could lead to greater in-flight safety.

Meanwhile, the in-flight ban on the use of

Continued on page 59

Announcing the Yingling ET-1

A new QRP classic.

Did you ever want to see what you could do with just a few parts? Well, here's one experiment you might find interesting. I decided to see what I could do toward making a small transceiver that would operate from the power of one "D"-cell flashlight battery. This article describes how successful I was in reaching that goal.

y approach started out with the following objectives: (1) Use one transistor and switch it between the receiver and transmitter sections of the transceiver. (2) Design both to operate from 9 volts DC. (3) Find a good switch and mount the transistor directly onto its common terminals. (4) Put the receiver components on one printed circuit card and the transmitter components on another printed circuit card. (5) Wire everything up with cables and connectors so that if you wanted to change either circuit, you could just plug in a new circuit card. (6) Since a transceiver is defined as a transmitter and a receiver that share common parts, I will claim

RCVR XMTR

MPF 102
TRANSISTOR

Fig. 1. System configuration.

that what I have built can be called a "transceiver," not a "trans-receiver." Hi. And (7) to *minimize* the parts count and complexity, design the ET-1 to be a one-band, 40 meter rig.

The overall approach is illustrated in Fig. 1.

Try it yourself

This project is easy to build. You don't need any special printed circuit cards, because for 40 meters the layout is not overly critical. You can use "ugly" construction if you desire. I chose to use pieces of the Radio Shack project card No. 276-150A because it makes everything a little neater. (A lot neater than my usual work!)

You can even build this project on a "pine board" if you like, and it will work fine on 40 meters.

Design source

The circuits described come from everywhere! Of course, as the project developed, I had to make my own engineering changes to make everything work to my satisfaction.

The receiver circuit is a regenerative detector (regen). The regen approach provides the best trade-off when considering parts count, sensitivity, and cost. It will receive both CW and SSB, and it will compete in sensitivity with your main rig.—Sounds impossible, but it is true. I have heard weak signals on my main rig and have then verified that I can also hear them on the regen.

In fact, you can tune in a signal on both sides of "null" or "zero beat" on the regen, thereby getting two for the price of one! Of course, you should use high impedance earphones for this regen, since there is only one transistor in the circuit.

The transmitter circuit is essentially a Pierce oscillator. This circuit is made up of ideas given in the ARRL Handbook, the QRP Notebook (W1FB), and the SPRAT magazine No. 69 (GM3OXX).

The resulting circuit for the ET-1 has the following parts count: receiver, 8; transmitter, 6; common transistor, 1; total, 15.

The antenna connection for the ET-1 is a coaxial cable connecting directly to my normal 40 meter antenna system. My antenna is a centerfed Zepp with open wire feeders and a home-brew tuner.

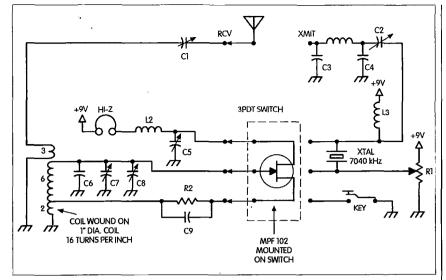


Fig. 2. The electrical schematic for the ET-1. Unlabeled coil is L1.

Detailed electrical circuit

Fig. 2 shows the electrical schematic of the ET-1. Please note that the MPF-102 transistor (Radio Shack, #276-2062) is mounted directly on the triple pole double throw (3PDT) common switch terminals. It is used for both the receiver and the transmitter sections. I selected the FET transistor because it works good in the regen. (See Table 1 for the parts list of the Fig. 2 schematic.)

Receiver notes

For the 40 meter band, tuning is set with the following: The 320 pF cap gets you to the 7.0 MHz range. The 6-70 pF cap lets you home in on the

C1, 2, 7	6-70 pF trimmer (Jim-Pak TC6-70)
C3	820 pF
C4	560 pF
C5	5-50 pF variable (regen control)
C6	320 pF (band select)
C8	Tiny one plate variable (band spread)
C9	0.1 μF
Ц	T50-2 core with 14 turns
L2, 3	100 μH inductor
Q1	MPF102 FET (Radio Shack)
R1	50k pot
R2	22k

Table 1, Parts list.

frequency of interest—in my case, 7040 kHz.

The small variable cap (one plate) lets you tune around 7040 kHz as a bandspread control.

The 5-50 pF variable cap provides feedback to the oscillator for sensitivity control. Adjust it until the regen is on the verge of oscillation. Any "squeal" indicates that you have gone too far!

This circuit works well and the layout for 40 meters is not critical, but try to keep your wires short.

You will hear a signal on both sides of "zero beat," allowing you to hear each signal "twice" on your dial, unlike your superheterodyne.

The 9-component (including the transistor) regen receiver will bring in signals comparable to those received by your expensive receiver. But, the selectivity will not be as good.

The downside of this story is that it is so sensitive that it can be easily overloaded by a strong signal or a nearby station. (I didn't care, so I did not try to put in any attenuation or volume control.) Also, at night with a contest on, the regen is pretty much unusable. (If you like, you can get some degree of attenuation by putting a variable resistor in series with the 9 volts supplied to the regen.)

With the limited frequency range that I wanted (7040 \pm 15 kHz), once

Continued on page 12



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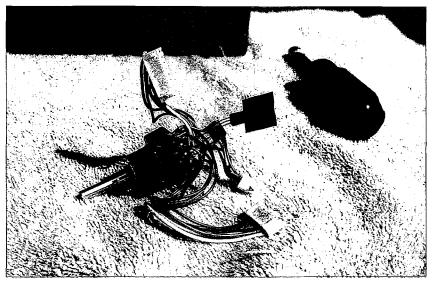


Photo A. The switch after the transistor has been mounted, and the cables that are used to connect to the receiver and transmitter cards. A third cable is used to connect the switch to the external plugs and jacks, which include the antenna connector, the headphone jack, the key jack, and the power plug. When assembled, the switch is installed on the front panel so that all "switchover" is accomplished with one throw of the switch.

Announcing the Yingling ET-1 continued from page 11

you set the regen control, you may not need to adjust it again.

Transmitter notes

Adjust the 50k pot and the 6–70 pF trimmer for maximum output of the transmitter into a 50 ohm resistor.

The transmitter puts out approximately 20 milliwatts. Power is calculated as follows:

- 1. (Peak to Peak volts)/2 x 0.707 = volts rms. For ET-1: 3 volts/2 x 0.707 = 1.06 Vrms.
- 2. (Vrms squared)/50 ohms = Power in watts. For ET-1: $(1.06 \times 1.06)/50 = 0.022 \text{ W} = 22 \text{ mW}$.

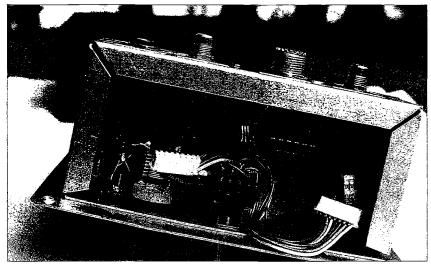


Photo B. The inside of the ET-1 unit with the switch installed but without any of the cards installed. I used pieces of an old card connector to provide mounting for my cards. The connectors have pin connections on them, but they are not used for electrical connections. I used them because they provided a nice springlike pressure slot to hold the cards in position.

General notes

The 100 microhenry RF chokes are somewhat noncritical. Try whatever values you have that are greater than 100 microhenrys. I happened to have a lot of the 100 microhenry chokes that cost me a penny each.

The 50 k-ohm pot is also somewhat noncritical. Try any pot up to 500k.

When I run this rig, I use one "D" cell from a flashlight for power. However, I cheat because I use a DC-to-DC converter to boost the voltage up to 9 volts DC.

I did not even put a power on/off switch on the ET-1; instead, I use the external power supply switch.

I did not put a sidetone monitor on the ET-1. I just use the sidetone from my keyer. There is plenty of space for later addition of a sidetone to the transmitter card if so desired in the future.

Detailed mechanical design

With the information already supplied, you should be able to construct your own ET-1 using your own mechanical design. However, you might be interested in what I ended up with when I started looking through my junk box for the various parts.

Almost immediately, I found "The SWITCH!!" I ran across a brand-new eight-pole double-throw switch that caused me to immediately go off on a tangent! I decided to switch everything at once instead of just the transistor.

I switched the transistor, the antenna, the 9 volt power, the headphones, the key, and I even switched the ground. However, I left the Fig. 2 schematic with the 3PDT switch for simplicity. You can adjust according to your junk box.

Initial setup

The initial setup consists of connecting the ET-1 to a 50 ohm dummy load. Using an oscilloscope or an RF probe plus your multimeter, adjust the transmitter for maximum output. Adjust the 50 k-ohm pot first and then adjust the C2 trimmer cap. No adjustments to these controls will be needed again.

Set the receiver frequency to 7040 kHz, by adjusting the variable trimmer

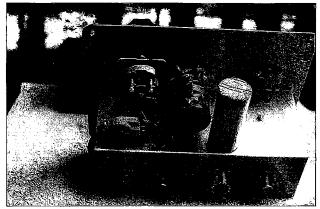


Photo C. The top deck of the chassis, showing the tuning coil with its lumped capacitors and the one plate, variable bandspread, capacitor. The crystal socket cable plugs into the transmitter card when installed. If you look closely, you may see that I used parts from my junk box for the capacitors, but the parts that I show in the parts list, the JIM PAK TC6-70, etc., will work just as well.

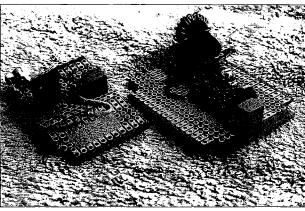


Photo D. The two cards. The receiver card is on the left and the transmitter card is on the right. If you look carefully, you can see the pin headers soldered onto the cards for connection to the cable connectors. (If you consider the space that I used to mount these 15 components, this has got to be the world's least efficient packaging scheme!) Hi.

on the top deck of the chassis. You can use a grid dip oscillator or a frequency meter, or you can even listen to the receiver oscillator on your main receiver. Next, adjust the "Regen control" on the receiver until just on the verge of a "squeal." Then adjust the antenna trimmer cap (C1) for best reception. One more tweak of the "Regen control" may be required. After that no further adjustments of these controls will be needed.

On-the-air performance

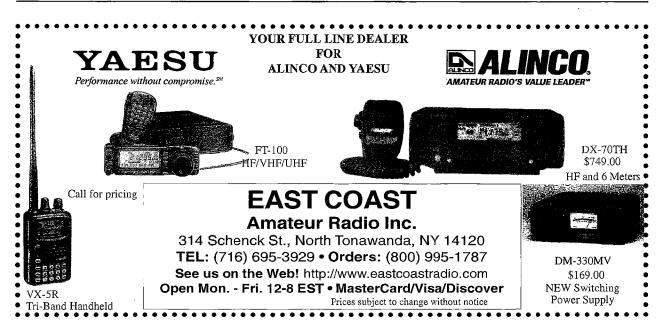
ET-1 performs on the air. I have had no reports of chirps or clicks, and the frequency is stable as a rock since it is crystal-controlled. My crystal is listed as 7040 kHz, but since I did nothing to "pull" it to that frequency, it ended up transmitting on 7040.7 kHz! Since I am "rockbound" I usually call a lot of COs or wait around until someone calls on my frequency.

All of my contacts were made using a 1.5 VDC "D" cell connected to a DC-to-DC converter that I got from the Electronic Gold Mine (Part No. It is hard to believe how well the | G6344), which boosts it up to 9 VDC. You may want to use a 9 volt battery instead.

Most of the contacts that I have made were the result of my calling CQ. This speaks well for a rig that only puts out 20 milliwatts. I estimate that 80% of the contacts were made by calling CQ.

All of the QSOs were made using the regen for reception. The regen is somewhat broad and other signals can always be heard, but it gives good performance. In fact, if there is

Continued on page 14



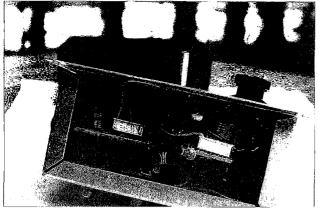


Photo E. The underside of the chassis, with the switch and the cards installed. One receiver trimmer capacitor is available at the top, but all other trimmers and pots are adjusted by lifting the card up somewhat so that you can reach them without removing the cables. (Doing it over again, I would put all those adjustments at the top of the card.)

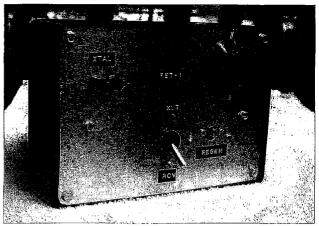


Photo F. The front panel. I did not have a nice regen control capacitor, so I had to settle for one with a screwdriver slot. But, as I said in the text, once it is adjusted for the small bandspread of the ET-1, it requires little future adjustment.

Announcing the Yingling ET-1 continued from page 13

interference, you can often tune to the other side of "zero beat" to get rid of it!

Using my centerfed Zepp antenna tuned to forty meters, I have worked 18 states and Canada. This was over a 60-day period and I averaged about 1 QSO a day. However, in my defense, I would give the following as a reason for the poor showing: After every QSO, I would sit back, pat myself on the back, and marvel for a long time, reveling in the glory of making a QSO

with such a mini rig. However, the most credit should be given to those on the other end who were willing to put up with such a weak-signal station.

Most of the QSOs were 1/2 to 3/4 of an hour duration, with solid copy on both ends. Only once or twice was a QSO terminated for poor copy on the other end. My reports ranged from RST 339 to 569. In general, my best luck was making QSOs in the morning and afternoon hours, probably because of lower noise levels on forty meters during those times.

My best DX was with Art WA4HXS

in Jonesboro TN, a distance of approximately 550 miles (as the crow flies), or 27,000 miles per watt!

States worked were: CT, DE, KY, ME, MA, MD, MI, NC, NH, NJ, NY, OH, PA, RI, TN, VA, VT, WI, plus ONT and QUE Canada.

During most of my QSOs, when I commented that my transceiver consisted of only 15 parts, that it was running only 20 mW, and that the power was coming from a "D" cell flashlight battery, I expected some statements of amazement. Instead, I mostly got a big "ho-hum"! So I guess that it may be true about ham radio operators being mostly "appliance operators." However, I would like to give a special thanks to Lenny W2BVH, who gave me a "Holy Cow!" and "Congrats!" Hi.

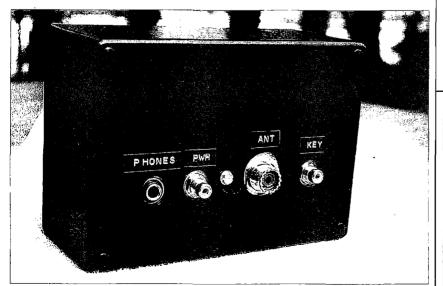


Photo G. The rear panel. I should note that the phone jack shown is insulated so that it doesn't provide any connection to the chassis since the receiver 9 VDC power comes through this headphone jack.

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More than a Modem Monitor

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"Status: Dialing ... waiting for the connect prompt ...
"Verifying user name and password ...
"Logging on to the network ..."

hile many a happy "online" session has begun with those comments from the monitor, many an unhappy session with the computer has started with just the first statement. Sometimes after the installation of new equipment you may spend several anxious moments waiting for the "connect" prompt. After a few unhappy sessions, waiting for a connect prompt that never appeared, I decided to take some of the guesswork out of the game.

Did the modem "pick up" the phone line? Did the computer really send out dial tones? Did a computer on the other end of the phone line really respond? Was that the voice of the computerized "operator" saying that I had misdialed? I prefer to have my mysteries from another form of the media, commercials notwithstanding.

What's my line?

Knowing some of the characteristics of an ordinary, analog phone line looked like a good starting point. When the telephone is hung up, "on hook" as the telco people call it, an analog phone line has a nominal 48 volts DC across it. When someone, or something like a computer, picks up the phone, and takes it "off hook," the voltage drops to about nine volts.

These are NOMINAL values. Do not calibrate your voltmeter by using these values. They are close to the real world and make good guidelines. It amounts to about a 5 to 1 change from an "on-hook" to an "off-hook" condition.

You may use an analog voltmeter, a digital voltmeter, or an LED indicator to let you know when the phone line is in use or when it is available. Additionally, hearing what kind of signal is on the line would be most useful. A simple, isolated audio amplifier could do that: no hi-fi system, just a cheap amplifier. Oddly enough, though, a cheap, solid-state amplifier gives better quality than is needed. Let's take a closer look at what we need and what we can get or make in order to take the guesswork out of our on-line modem connections.

Voltage indicators

The phone line supplies enough current to drive most analog meters and any digital voltmeter that I have seen, and it will drive an on/off LED indicator with or without some amplification. We will let the phone line supply the current needed for that simple (LED) amplifier.

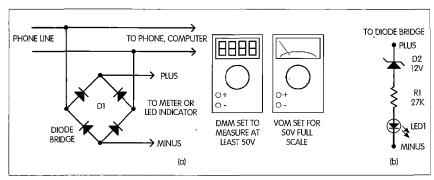


Fig. 1. Line monitor. Direct approach, two methods. (a) Voltmeter across the line. (b) LED indicator.

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Photo A. Built-in voltmeter and speaker amplifier let you monitor the status of the phone line as well as hear what is on it.



Photo B. A more compact version, but with everything included. Tell at a glance if the computer or the kids are connected to the phone or if they got disconnected. The binding posts on the lower right let you use the monitor as an auxiliary amplifier in the workshop or the ham shack.

A direct approach

Fig. 1(a) shows a direct approach: a voltmeter across the line. In the real world, sometimes the voltage changes from one of the lines being plus to the other one: something about the call going through another switching office. Whatever causes it, the lines can and do change polarity. So, many devices that connect to a phone line have a full-wave bridge rectifier across them. That keeps the voltage going in the same direction to your project: plus to the plus input. Keep in mind that the RING voltage runs around 90 V rms. So do use higher voltage diodes. And of course, your project may need some protection from the RING voltage.

On hook

When the phone is hung up, or on

hook, the line sees little or no practical load. The voltage will measure about 48 V DC. As long as your measuring system draws only a small current, it may stay on the line all of the time. In fact, I have an OFF-HOOK indicator, Fig. 2, across the line all of the time. In the past, I left a meter like the one in Photo B across the line until the LED indicator was available for that duty. While I cannot give you a precise figure, the line does not seem to mind something on the order of one or two mA.

LED me see indicator

Fig. 1(b) shows an LED circuit that will let you know when the phone is on hook. As long as the phone line delivers at least the voltage dropped in the zener diode, plus what the LED

needs, the LED will light. Staying within the limits just mentioned, only the extra-bright, high-efficiency LEDs will give a good light at that low a current. Of course, a cheap LED with some shade makes a useful indicator. Still, that makes a good starting point. If the light is lit, the modem did not pick up the line: for that matter, neither



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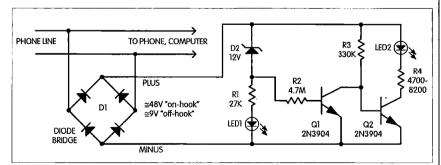


Fig. 2. Off-hook indicator. Tell at a glance if someone else is using the phone, or if it's OK for the computer to go "on-line." While you are at it, let the phone line supply the power. The diode bridge feeds the DC from the phone line to the OFF-HOOK indicator. LED1 shows when the phone is hung up, on-hook. LED2 shows when someone or something has picked up the phone, taken it off-hook. Voltage across the phone line runs about 50 V on-hook, falling to around 9 V off-hook. The different voltage levels trigger either LED1 or LED2: green, red.

Ri	27k				
.D1	Diode bridge, 1 A 200 V bridge, 276-1161; or four 1N4003s, 276- 1102 wired as bridge				
D2	12–15 V zener diode, 1N4742 (12 V), 276-563; 1N4744 (15 V), 276- 564				
LED1 Green, orange, or yellow high-brightness LED, 276-206 (orange); 276-205 (yellow); 276-215 (green, not too bright)					
(274-725) (Binding posts (274-662) or banana jacks (274-725) (for plugging in meter rather than building in one)				
Meter	0-1 mA (22-410) and a 56k resistor; or use a 39k resistor plus the 15k that comes with the meter				
	values for other common meters ut 50 V full scale:				
0–500 μΑ	100k for 50 V FS				
0–200 μΑ	250k, 50 V FS; 270k, 54 V FS (220k + 27k standard values will come close to 250k)				
0–100 μΑ	500k, 50 V FS; 560k, 56 V FS (470k + 27k standard values will come close to 500k)				
0-50 μA	1 meg for 50 V FS				

Table 1. Fig. 1 parts list. Radio Shack part numbers in all parts lists.

did the teenagers at the other end of the house.

The LED, zener diode, and resistors cost little and take up little space. However, it would be nice to know, not by default, but by direct indication, when the modem or the children have picked up the phone. By adding three

R1	27k
R2	4M7 (4,700,000 ohms)
R3	330k
R4	4.7k-8.2k
. D 1	Diode bridge, 1 A 200 V, 276-1161; or four 1N4003s, 276-1102 wired as bridge
D2	12-15 V zener diode 1N4742 (12 V), 276-563; 1N4744 (15 V), 276-564
QI	2N3904 or equiv., minimum beta, H _{FE} 100
Q2	2N3904 or equiv., minimum beta, H _{FE}
LED1	Green, orange, or yellow high brightness (see Table 1 for P/Ns)
LED2	Red high brightness, 276-086; 276-307 is cheaper and smaller, but perfectly usable

Table 2. Fig. 2 parts list.

resistors, two transistors, and one more LED, you have a direct indication. **Fig. 2** gives the simple circuit for an OFF-HOOK indicator.

Disconnect

Once in a while during a session, the screen says that it cannot find some connection. A quick glance at the LED indicator from Fig. 2, or the voltmeter, tells me what happened. The LED went off, and the voltmeter went high, meaning that something caused the modem to hang up. After some annoyance and a little while, the screen says something to the effect that " ... connection reset by peer ... try connecting again." Not sure what that means, except that it disconnected the phone line from the computer during a session. For that reason, I built just the circuit of Fig. 2 and leave that part of the Line/Modem Monitor across the line all of the time. That frees up the system shown in Photo A to go to work with my son.

How and why

In either circuit, Fig. 1(b) or Fig. 2, as long as the line voltage stays above about 18 volts, the zener diode and LED1 will conduct enough current to light the LED. R1, the 27k resistor, limits the current in LED1 to a value compatible with the telephone line. The 4.7 megohm resistor, R2, supplies base current to transistor Q1. That causes enough current to flow through the collector circuit of Q1 to keep Q2 from turning on. When the modem picks up the phone and seizes the line, the line voltage drops to about nine volts: the zener diode quits conducting. That turns off both LED1 and Q1. That lets base current flow into the base of O2 through R3, the 330k resistor. When Q2 turns on, it draws current through LED2 and R4, the 4700 ohm resistor.

With the values shown, LED2 will have a nominal 1.5–2 mA current. Again, for best results, that calls for one of the high efficiency LEDs. I built some of these "off-hook" indicators before the high-efficiency LEDs were readily available. They worked,

but with these LEDs you see the status of the line with less eye strain.

Voltmeter or LED?

Depending upon your particular application, you may find a voltmeter a quick, practical answer. The LED circuit costs little and could be left across the line without tying up a multimeter that has many other uses. When we get to the construction section, we will give this some additional consideration.

What's on my line? Or, hearing is knowing

With some sort of voltage indicator on the line, we can tell when the modem has picked up or seized the line. That does not mean that the modem has sent dial tones or that the intercept operator isn't telling you to "... please hang up and try your call again." Those are messages that your computer cannot readily give to you. Most modems let you program them to give some sort of sound until they connect. Sometimes you can even hear them. We have a cure for that with the other part of the Line/Modem-Monitor.

Sound off!

The simple audio amplifier shown in the middle of Fig. 3 can give you a real earful. It uses readily available parts and draws little current: under eight mA without an input signal. Despite what the spec sheets say, my VOM showed around eight mA, an acceptable level to give reasonable life for a 6–9 volt battery. That can come from a handful of AAA cells or from a 9 V battery.

The LM386 amplifier has more than enough gain to amplify the signals that you want to hear on a phone line.

Due to various regulations brought about by practical considerations, the outgoing signal on the phone lines runs just under 0.8 volts rms for sine waves. The incoming signal runs somewhat lower: around one-tenth of that. The outgoing dial tones from the telephone measured right at 0.77 V. The outgoing dial tones from the computer measured just about 0.5 volts. The dial tones consist of two sine

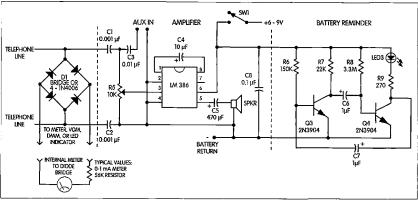


Fig. 3. Line monitor with voltmeter, monitor amplifier, and battery reminder. Meter or LED indicators let you know if the line is in use. Amplifier lets you hear beeps, tones from your computer, as well as incoming signals from the phone line. That includes answering beeps from another computer, as well as messages from the operator telling you to "... try your call again." The amplifier will let this system double as half of a speaker phone. The section to the left of the first dotted line lets you monitor the line voltage. The speaker amplifier sits between the dotted lines. The optional battery reminder is to the right of the dotted lines. It uses little power and its gentle wink can remind you that the unit is still on. The first section may connect to the internal meter which is shown, or it may connect to an external VOM/DMM or the LED OFF-HOOK indicator, Fig. 2.

tones in various combinations to produce the various dial-numbers. The communication tones or pulses from the modem confuse a voltmeter. They are not sine tones. Therefore, the voltmeter cannot give accurate readings unless it is one of the special voltmeters made for this type of measurement. However, those readings can have a useful significance.

The communication pulses from my computer showed up at about the 200 mV level on the analog VOM. A more accurate measurement could be obtained by isolating a scope and connecting it to the phone line. Isolation is necessary because the phone line likes to stay balanced with respect to ground. It does not like grounds on either side of the line.

However, since the VOM is more commonplace, I suspect that most of us find the VOM readings much more practical and meaningful. A cheap DMM showed a nominal 200 mV at the same time the VOM did.

In simple English

Simply stated, you now have some readings that you can use for comparison if you start going rounds with your modem. If you use a VOM to check for these low-level AC signals, use the

OUTPUT function or put a $0.1~\mu F$ capacitor between the line and the meter to keep the 48 volt telephone "battery" voltage out of the meter.

Setting up the LM386

You may set the gain on the 386 to accommodate the level of interest to you. By adding the capacitor shown in the spec sheets, you have enough gain to hear the incoming pulses, the incoming voice announcements, and, of course, the outgoing tones and pulses. The volume control lets you set a comfortable listening level. You may want a higher volume listening to the intercept operator than when listening to your computer talk to another computer.

DC isolation

As mentioned earlier, with the phone hung up, the phone line has a nominal 48 volts across it, and the ring voltage runs around 75 V (measured) to 90 volts AC at a nominal 25 Hz. Both of these voltages must be kept out of the inputs to the 386. Any size capacitor will keep the DC out, almost. When a blocking capacitor first charges, that could give enough of a pulse to damage the amplifier. Use a small capacitor and give it a parallel path to use for

C1, 2	0.001 μF 100 V			
C3	0.01–1 μF			
C4	10 μF 16 V			
C5	470 μF 10 V			
C6, 7	1 μF 10 V			
C8	0.1 μF 10 V			
R5	10k pot, 271-215 (includes On/Off switch)			
R6	150k			
R7	22k			
R8	3M3 (3meg3, or 3.3 megs, or 3,300,000 ohms)			
R9	270			
Q3, 4	2N3904 NPN, minimum beta, H _{FE} 100			
LED3	Red (276-068), green (276-069) — cost a bit more than others, but have a nice holder			
LM386	Low power audio amplifier			
8-pin DIP socket	For LM386			
D1	see Table 1			
Binding posts, banana jacks	see Table 1; jacks also used if you want to wire the AUX IN			
SW1	On/Off; SPST, 275-406 (if you do not use the pot/switch above)			
Meter.and suggested values for other meters	see Table 1			
Speaker	2 inch replacement type, 40- 250 or a 273-092 8 ohm (4-16 ohms OK). Spkr may be as large as you like, 1 inch to on- sale 5 x 7 inch oval (bigger box needed)			
Вох	ABOUT 7 x 4 x 2" for system shown in Photo A . Smaller box (270-213) will work if you build just part of the system, or the unit shown in Photo B . See what they have in stock when you get there.			
Circuit board	Perfboard, an easier-to-wire PCB from Far Circuits (see caption).			

Table 3. Fig. 3 parts list. PCB available from Far Circuits, 18 N 640 Field Court, Dundee IL 60118; (847) 836-9148; [farcir@ais.net]; \$5.00 each.

charging, and that will protect the amplifier. Really, it works. The 10k volume

Continued on page 20

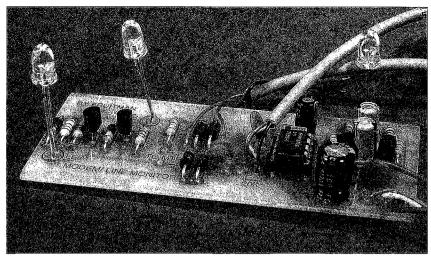


Photo C. Printed circuit board used in the second unit, **Photo B.** Center of board, D1, diode bridge. To the right of that, C1, C2. I used 0.002, as they were handy. Changed them to 0.001 as called for in the circuit due to an apparent problem with slower network connections. The smaller the caps, the better. To their right, the connections to the volume control. This prototype board says 20k, but the actual value is 10k. Amplifier to the right of that. Lower right is C5, 470 µF cap going to the speaker. Above that is the battery reminder and LED3. LED1 lower left.

More than a Modem Monitor continued from page 19

control combined with the two 0.001 μ F capacitors in Fig. 3 do just that.

The 25 Hz ring voltage sees a nominal 12 megohms looking at the 0.001 μ F capacitors. That sends an insignificant part of the ring voltage to the input of the amplifier. If the volume

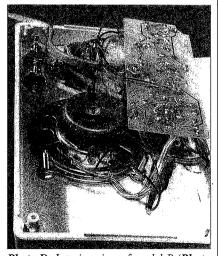


Photo D. Interior view of model B (**Photo B**). AUX INPUT upper left of photo. Notch in box for input connector with RJ11 plug. Volume control and ON/OFF switch, top center. Notch in circuit board allows it to fit in this box, which has a special compartment for a 9 V battery.

control is wide open, and if my arithmetic is close, that would be around 0.2 volts. With the amplifier on, I have heard a series of pulses when the phone rang. That also meant that I got to go on-line later — after the children got off the line.

Another advantage of a small capacitor lies in its ability to reject low frequencies. The nominal 25 Hz ring voltage is much lower than the lowest frequency of interest in this application. So, a small capacitor will help reject both the DC voltage and the unwanted low frequencies.

Battery reminder

The battery reminder shown on the right side of Fig. 3 can save you some consternation. You may want to include it in other battery-operated projects. It draws little current, and the friendly wink from the LED can remind you that the project is on and draining the batteries. In this case, it's a slow drain; in other projects, it might be a faster fade for forgotten battery-operated equipment.

The circuit consists of a simple cross-coupled amplifier, which makes it an oscillator, with the LED in series with one of the collectors. With the values shown, the LED will flicker on

about once every two to three seconds. You may juggle the values about 20–30 percent and still have a useful pilot light. You would want to juggle or "adjust" the values to get a faster flicker, a slower flicker, or a brighter light, or because you do not have the values shown.

Putting it together

Photo A shows the finished monitor with an internal voltmeter and built-in RJ11 jacks. This one includes the amplifier and the battery reminder. You could save a bit of work by replacing the meter with a pair of jacks and simply plugging in your VOM/DMM. You could use one of the LED indicators. Either method will tell you at a glance if someone, or the computer, picked up the line.

Photo B shows a somewhat smaller model that includes everything. It has the internal voltmeter, the LED indicators, and the speaker amplifier. The modem connections consist of a wire with modular plug coming out of the unit. That saves a lot of panel space, and a lot of milling. You can get around the lack of loop-through feature by using a double plug, the type that lets you connect two plugs to the same jack. Photo D gives an interior view of this system. For those who like to make their own boards; Figs. 4-6 give you the layouts.

Milling, drilling

A piece of graph paper taped to the front panel may help with the layout. Place the parts on the paper and mark their positions with pencil. That makes it easy to change if needed. The graph paper can prove most helpful if you use the speaker amplifier. By drilling on the grids, you can get nice, uniform holes for the sound, without having to put an external grill on the box. I figured that one out after cutting a large hole for the speaker and making a speaker grill out of a piece of perfboard. It covers up my 'machining' in Photo A

Although I found the layout shown in **Photo A** convenient, you may make it to your liking. I used the extra large

Phone Lines

Many of us have seen the notation REN 1 on a telephone device. After checking with several authorities, I found a definition for that. It means that when the device is "on hook" hung up, it will draw no more than about 1 u.A: The telephone device should not exceed that nominal limit. Actually, all of the devices connected across that line should not total more than REN 5. At least, that is my understanding of REN, Ringer Equivalence Number.

A public utility may complain if one of the systems shown in Figs. 1, 2, or 3 is left on the line. They should have little to say if you momentarily connect a circuit across the line in order to determine the state of that line. When trying to tell if a phone is dead or if it is the line. I have hung an analog voltmeter (Simpson 260) across the line for a few seconds.

A private telephone system, such as we have at work, has not complained, and the circuit of Fig. 2 has proved most helpful.

If you remove everything to the left of C1 and C2 (the first dotted line) in Fig. 3, the rest of the circuit should not give the public utilities cause for concern. The audio amplifier will let you monitor the outgoing and incoming audio signals. The battery reminder will remind you that the amplifier is on.

Once the modem picks up the phone line, you could reconnect the first part of the circuit and have the advantage of a visual indication of the state of the line.

The voltmeters shown in Fig. 1 draw more current than the public utilities like to see leaking out of their system. You could replace the meter with an electrometer, an ultra-high impedance meter, but that defeats the purpose of the system: It becomes a complex instrument instead of a simple, practical method of getting useful, needed information. You could use CMOS circuitry and suitable resistors to limit the current to the 4-5 µA range.

If you remove LED1 and R1 in Fig. 2, you should have an OFF HOOK indicator that complies. The impedance presented by the combination of the 4.7 meg resistor and the transistor figures out somewhere in the area of 15 times the minimum that they, the phone company, like to see.

In short, this article shows how to make some systems that can help you determine the state of the phone line and let you monitor the signals where that is permitted. Some of the public utilities may or may not object to your using this on their line. A private, in-house system probably will not. You will have to determine if it is suitable for your application.

I have found these systems useful while tracking down problems involving dial-up telephone connections, whether for a simple voice connection or for a computer/modem connection.

binding posts because they were available. That saved a trip to the store. There is nothing critical about how or where the parts go in the monitor.

First, drill pilot holes for everything. Then, make the large holes for the RJ11, modular jacks, should you choose that option. If you use an internal meter, make a hole for it next. Mount it last. I suggest the large holes first as they are the ones most likely to give the most trouble. On some occasions, they have given enough trouble that I had to start over: new cover.

I try to mount as much as possible

on the cover. That preserves the box and simplifies the wiring. The battery holders mount on the inside of the box. The handle came from a hardware store. It is a drawer pull and looks so much nicer than the "electronic equipment" handles. You can get the drawer pulls in a variety of decorator colors: the chrome and the bright brass go well with most decors.

Photo B, a better way

The more compact unit shown in **Photo B** has the smaller binding posts. The trick with the graph paper worked

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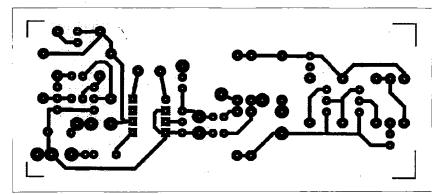


Fig. 4. Foil side 1:1.

well. It worked especially well since my neighbor Walt Olson was kind enough to mount the speaker, the LEDs, the board, and particularly the meter. He likes to spend time with his mill. I let him. The meter came from an old tape recorder and would have strained my "machining" abilities beyond the limit. Walt managed to cram 10 pounds of parts into the proverbial 9-pound box. That is why the model in **Photo B** is so much smaller than the unit in **Photo A**.

Circuit boards

The model in **Photo A** uses perfboard. However, one of the extra nice but inexpensive boards from Far Circuits went into the unit in **Photo B**. That makes construction almost a snap. As **Photo C** shows, you can populate as much of the board as needed for your application. That could include the amplifier, the battery reminder, and the OFF-HOOK indicator.

The only problem that I have had with the boards came from missing a solder connection or two. When you finish soldering the board, go over it with a reading glass and a bright light, looking for solder whiskers that extend from one run to the next. Also, look for unsoldered wires sticking through the board. That's what I said, too, until I had to go back over a board to see why it did not work.

Checkout time

If your version includes just a meter and the modular jacks, plug a suitable cord into the phone line and into the monitor. The meter should read near full scale, about 50 volts. Take a phone off-hook: The meter should drop down to about 9 volts. The NC and C marks on the meters in **Photos A** and **B** indicate Not Connected and Connected.

LED indicators

If you chose the single LED indicator of Fig. 1(b), it should light when you connect the input to the phone line. Taking a phone off-hook should turn off the LED. If it does not, take a voltmeter and check the phone-line voltage. It should have dropped to around 7-9 volts. Hang up the phone and put the voltmeter across the zener diode. It should read 12-15 volts depending upon what you used. If it reads around 1/2 to 3/4 volt, disconnect the unit and reverse the connections to the zener diode. If the cathode, the end with the band, reads minus, reverse the leads from the diode bridge to the indicator.

Make sure that the LED went in the right way. Put a clip lead across the zener diode and connect a nine volt battery across the resistor and the LED. Even at that low current level, the LED will give a visible glow. If you want to be real sure, hang two or three nine volt batteries in series and try it again.

Off-Hook Indicator

If you went for the full feature OFF-HOOK indicator, Fig. 2, all of the above applies. When LED1 turns off, LED2-should light. You can test that with a single nine-volt battery in place of the diode bridge. Watch that you put the plus to the top of the circuit, minus to the transistor emitters. If LED2 does not light, put a clip lead from the

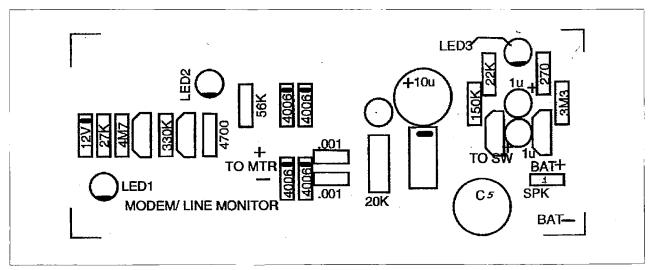


Fig. 5. Component side.

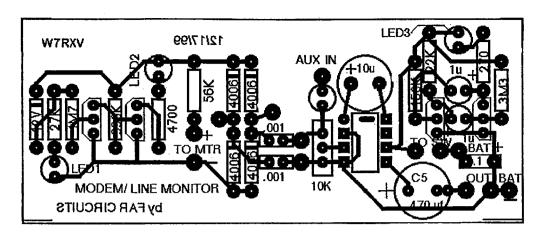


Fig. 6. X-ray view of board.

collector of Q2 to its emitter. If the LED still stays dark, check that the anode of the LED goes to the battery plus.

You are most likely to encounter these problems with perfboard construction. With a PC board from Fred, if you have a malfunction, it will probably come from a diode getting into the board the wrong way, or a missed solder connection.

Special (bug) feature

After my neighbor, Walt, kindly packaged a unit for me, I gave him a board of his own to play with. He said that when his computer went on line the red LED lit as it should. But, if he turned a bright desk light on the green LED (LED1), LED2, the red LED, turned off. After we verified that the LED did indeed respond to incoming light, I looked for a cause and a cure.

The cure came in the form of a resistor shunted across the green LED (LED1). Any value from 10k to 1 meg works well. It seems that you can excite the elements in an LED by driving a current through them the normal way, or you can shine a bright light on them and they will generate a voltage. In fact, some of them even give off their characteristic glow. I thought that it was just an overactive imagination until I asked the right people some auestions.

I checked with George, ex-WA6CJZ,

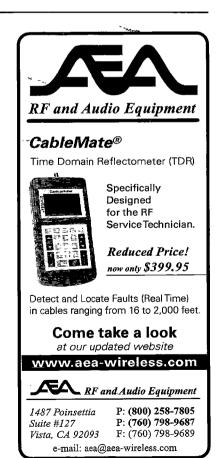
inside the LED. He teaches physical chemistry at Arizona State University. I work in the same department. George had a simple (to him) explanation. When a bright light hits the interior of the LED, it excites electrons. They move to a higher plane, then drop back to their original state. In the process they give off a photon and generate a nominal 1+ volts. They have only a minute current available when excited by a bright light. An ordinary DMM or VOM loaded down the "LED battery" and showed practically no output. I measured it on a scope and later on an electrometer. Under those almost ideal conditions, a red LED showed about 1.3 volts and a white LED showed close to 2 volts. The white LED has more voltage across it when driving it the normal way with a battery and a current-limiting resistor: about 3.5 volts. So, I would expect to see a bit more voltage across it when exciting it with a strong light.

With the output of the LED battery going into a high impedance circuit, Fig. 2, R1 and R2, it delivered enough voltage and current to turn Q1 back on turning off Q2 and LED2. Mystery solved. Annovance abated. Walt wanted to use it as a photocell. I just wanted the OFF-HOOK indicator to work as I had seen them work for a number of years.

One more "special" feature

I happen to live in a relatively high to find out just what was happening | RF field: 0.6 V/M day, 1.2V/M night. While working for local radio stations I measured that several times. A 5000watt station has its four-tower array less than two miles from my home. Guess where the main lobe is at night. Once in a while it took a filter to get

Continued on page 24



More than a Modem Monitor continued from page 23

them out of the phone and some of my short-wave equipment.

After connecting the newer Line/Modem Monitor to the computer, it seemed that at times the network ran really slowly. No, I mean slower than normal. I lit up the old 486/66 with a DOS E-mail program. The screen displayed lots of cryptographs that may or may not have meant anything to the computer. I pulled the L/MM loose and the cryptographs went away. Winding the long cord tightly around



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6196 Jefferson Highway Mineral, Virginia 23117 USA 540:894-5777•800:282-5628 Fax 540:894-9141 e-mail: info@buck.com the L/MM cured it, too. A quick check showed that the network was running at a more normal speed again.

Some computers/modems have greater sensitivity to that type of interference. This one seems to be borderline. If you think that RF could cause you this type of problem, put a small RF choke or ferrite beads in the lines to the L/MM. To keep the local "listen" show host out of the auxiliary input of the first L/MM, I put a 7 mH choke (I had it on the shelf) in series with the high side of the input. A 0.001 µF capacitor effectively bypasses it. According to my arithmetic, anything from 500 μH and up should give effective suppression.

Speak out

If you added the speaker amplifier, turn it on, and if you used the battery-reminder option, watch for the flickering LED. A good pretest consists of putting a milliammeter in series with one of the battery leads, or across the ON/OFF switch with the switch in the OFF position. It should read around 5-10 mA depending upon the battery voltage. If it reads nothing or too high, look for missed connections or shorts.

Amplifier testing

Normally, the amplifier gets its input from the phone line. However, since a utility amplifier has many additional applications, I added an external input, the oversize binding posts in **Photo A**: the AUX IN. Before connecting the unit to the phone line, you may feed a low level signal into the EXTERNAL INPUT terminals and listen for the sound. Fifty to one hundred mV from a radio or a signal generator will drive the amplifier to full output. Do not expect hi-fi, but rather a sound like you would hear from a communications receiver.

If that sounds good, disconnect the signal generator, plug the amplifier into a phone line, and turn down the volume. Pick up a phone on the same line and dial a number. You should hear the tones loud and clear. You will have to mute the telephone mic or keep it away from the speaker to prevent acoustical feedback. The first

time that you hear that, it may sound like music to your ears because it means that the box works, however, after a while ...

While listening to the modem, a sound level meter indicated that the amplifier was delivering an uncomfortably loud 90 dB SPL at a distance of one meter. The amplifier still had gain to spare.

Speaker phone

When you have the telephone mic muted, you can use the amplifier feature as half of a speaker phone. Call one of the telephone on-line services and get an earful without having to hang on to the telephone receiver.

Modem, at last

When everything looks good, connect the monitor to the phone line and to your computer. You will need a second cord for the version in Photo A, or a two-to-one jack for the unit in **Photo B**. The two jacks are wired in parallel, so either one can go to the phone line. If you have either the voltmeter feature, or one of the LED indicators, you should know at a glance the state of the phone line. If no one else has the line tied up, tell your computer to connect to a remote site. You should hear the dial tones followed by the beeps, squeaks, and other assorted sounds that accompany a successful connect, or silence to indicate a successful disconnect.

You can get an idea of what is going on when you send a fax from your computer to another computer or to a regular fax machine. In addition to what the computer screen says, I get useful information regarding the progress of the fax transmission from the speaker amplifier. It also lets me monitor E-mail sessions and "search" sessions without having to keep an eye on the light or the meter to see why the computer cannot find some host. Try it a couple of times. I think you will like it

Now, during your on-line sessions, you will be able to confirm the statements on your computer screen by glancing at your Line/Modem Monitor or by listening to it.

Inside Digital TV/VCR Tuners

Part 4: Testing and binary data format.

The first three parts of this series on digital TV/VCR tuners discussed the two types of tuners, along with control and the test system that I used during my study of the digital tuner. Specific subjects covered were the synthesizer used to control the local oscillator (VCO) within the tuner, a data transmitter used for sending control data to the tuner, and a data receiver used for observing the data that has been sent to the tuner. In this part of the series we will discuss "how to test" the digital tuner and will describe the methods for setting up the binary data format used for controlling a digital tuner.

The testing of a digital tuner is reasonably simple once a method has been developed for clocking serial data into the tuner. With a data transmitter, microcontroller, or computer operating as a controller, it's necessary only to enter band select information and frequency, and select data in a binary format for the tuner to operate. Upon receiving data in the correct format, the tuner functions in a manner like that of the more familiar analog varactor TV/VCR tuner. Binary formatted data is used to control the tuner's frequency synthesizer. Fig. 1 shows the data sequence format from MSD on the left to LSD on the right.

The frequency synthesizer within the digital tuner has a main divider chain that sets up the frequency ratio between the tuner's local oscillator (VCO) frequency and the reference frequency applied to the reference port of the phase detector. When the divide ratio number is known, it is then converted from a decimal number to a binary number. In a binary format, the ratio number is clocked serially into the tuner's register.

For the TV/VCR digital tuners that I have encountered, the main divide ratio

is determined by dividing the VCO frequency by 62.5 kHz. Some digital tuner synthesizers have optional step frequencies other than 62.5 kHz, but when used, the local oscillator (VCO) frequency band is altered to some degree. Gaining control of the optional step feature usually requires setting up the control data format to clock 34 bits of data instead of the normal 18/19 bits.

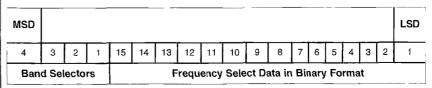
As an example of the process involved in finding the data format, choose a VCO frequency of 101 MHz, as is the case when the tuner is set for TV channel 2. Dividing 101 MHz by 62.5 kHz yields a divide ratio of 1616. Converting 1616 into a binary number provides the data format that can be clocked into the tuner's synthesizer. The binary conversion may be done using a great many different techniques, but the easiest is shown in Fig. 2. Although the use of a calculator will

speed the conversion process, it isn't required when the indicated steps are followed. To help keep track of the final number and to verify the accuracy of the conversion, it is recommended that a worksheet as shown in Fig. 2(b) be used as a guide.

Method for calculation

Starting with the known information such as the desired oscillator frequency and the synthesizer step frequency, determine the decimal divide ratio that is needed to generate the desired oscillator frequency.

When the divider ratio is known, subtract the largest binary number from it. In the example, the divide ratio is 1616 and the largest binary number that can be subtracted from it is 1024. Subtracting 1024 from 1616 leaves a remainder of 592. A binary "1" is assigned to the location in the



have encountered, the main divide ratio | Fig. 1. Data format required for controlling a digital TV/VCR tuner.

Known	Desired	d oscillator	(VCO) f	requency = 10	1 MHz											
KHOWH	Synthe	sizer step	frequenc	y = 62.5 kHz	_			_		•						_
Fig. 4	Synthe	sizer divid	e ratio												-	_
Find	Binary number to be clocked into the tuner's register															
	·				N = divi	der ratio =	OSC f	req/ste	p freq =	= 101	MHz/0	.0625 = 16	616			
	Steps			(a)	,	(b)	(6	c)	(0	i)		(e)	(f)		(g)
			1616 -	1616 - 1024 = 592 592 - 512 = 80 80 < 256 80 < 128 80 - 64 = 16 16 < 32 16 -						- 16 = 0						
	Assign			1		1 0 0		0 1		0		1				
						(a))									
Osc. Freq.	N	16384	8192	4096	2048	1024	512	256	128	64	32	16	8	4	2	1
101 MHz	1616	0	0	0	0	1	1	0	0	1	0	1	0	0	0	0
448 MHz	7168	0	0	0 1 1 1 0 0 0 0 0 0 0 0						0						
			I			(b))		•		 _	•	•		•	

Fig. 2. Shows the required input information and the steps involved in converting a decimal number to a binary number. (a) Shows the steps used to find and convert from a decimal number to a binary number. (b) Shows how the binary number is charted in the desired format for clocking data into the digital tuner's register.

chart under the number 1024. A binary "1" is assigned each time a number can be subtracted from the remainder. A binary "0" is assigned in the location when a subtraction cannot

be performed. In the case of the remainder "80" being smaller than "256," there is no subtraction so a binary "0" is assigned under the 256. Also in the example, 16 is the last

number where a subtraction takes place which allows the assignment of "0" to all of the other binary locations.

So that the process of converting from a decimal number to a binary number is clear, a second example is provided in the chart for a VCO frequency of 448 MHz. In this case, a synthesizer divide ratio of 7168 will be required. As the subtraction process occurs, a binary "1" is placed in the columns headed up by 4096, 2048, and 1024. All remaining columns contain a binary "0".

In part five of this series I'll provide a BASIC program that will calculate the binary number for any tuner "receiver" frequency, along with the local oscillator frequency that is selected.

Test setup

Fig. 3 shows the connections to the digital tuner, data transmitter, data receiver, and all of the power supply voltages. A voltage table is provided that may be used as a guide as to the typical current that the user should supply for operating all of the pieces contained in the test system.

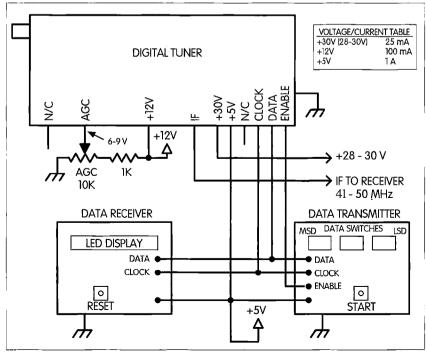


Fig. 3. Test setup and power for testing and/or using a 3-wire digital tuner.

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Even though the figure is pretty clear as to how things are connected, a few words may help clear up any questions that might remain. All like terminal functions are tied together on all items. As an example, the data terminals on the tuner, data transmitter, and data receiver are connected together. The wires should be of short length and insulated, but shielding is not required. In other words, excess wire length should be avoided, but the units do not have to be crowded.

To gain a perspective on the physical layout of a digital tuner, refer to Fig 4. The two main areas of interest are the mixer/oscillator section, and the synthesizer section. The synthesizer section is readily identified because there will be a crystal mounted close by the synthesizer IC. In most tuners, the mixer/oscillator IC will be a surface mounted device soldered onto the circuit side of the circuit board (bottom side). Knowing the physical layout of the tuner becomes important during the test and checkout of the tuner.

Testing the tuner

All of the required voltages must be applied to the tuner so that it will be active and ready to operate. The input data is entered into the tuner by setting the switches on the transmitter and pressing the "start" switch. The tuner resets for the next data entry whenever the ENABLE line goes HIGH. Data entered previously into the tuner is retained by the tuner as long as power is applied and the ENABLE line remains LOW.

Band and frequency select data can be sent to the tuner at any time after power is applied. But during the initial stages of testing, the data set position relative to how the synthesizer data register "sees" the data can be an unknown and requires some initial experimentation. Shifting the data bank back and forth a bit or two will usually suffice, but finding the MSD and or LSD bit location within the tuner's register may be a little elusive.

One technique that I've used that appears to work with most tuners, particularly those having a synthesizer chip with known band control pinouts

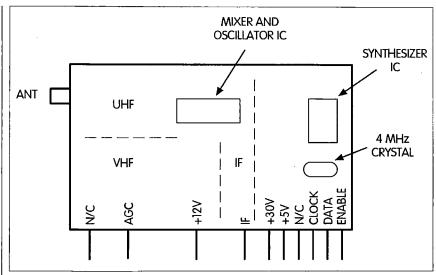
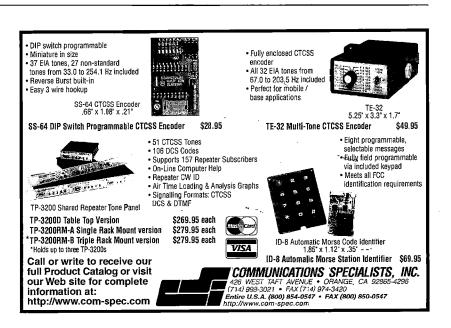
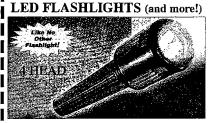


Fig. 4. Typical component placement and RF sections within a digital tuner.



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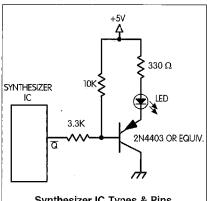
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Synthesizer IC Types & Pins

MC44817D	
IVIO NN O17D	Pin 15
TD6359 P/N	Pin 20
TD 6380 P/N	Pin 20
TD 6380 Z	Pin 16
ΓD 6381 P/N	Pin 20
TD 6381 Z	Pin 16
TD 6382 P/N	Pin 20
TD 6382 Z	Pin 16
	TD 6381 P/N TD 6381 Z TD 6382 P/N

Fig. 5. Synthesizer phase lock indicator. LED transistor driver is connected to the lock detector's output pin.

(one of four), is to measure the voltage on the selected pin. In the absence of known pinouts, tracing the tuner's band control transistor base circuits back to the synthesizer IC provides a level of confidence. A strong magnifying glass and an ohmmeter are usually required during the tracing process.

Once the band control pins have been identified, and with the data transmitter connected, enter only the "band" bits one at a time and attempt to determine with a voltmeter the band control terminal voltage that responds to a particular band bit sent by the data transmitter. The voltage on the band control pin will shift from an unselected voltage level of 12 V downward to a value below 7 V upon selection.

When the four band bits (of which only two or three are used) have been "mapped" on the data transmitter's switches, the first band bit (whether a "0" or a "1") to be clocked into the tuner is the MSD band bit, with the remaining three bits to follow. Because the band select bits are "pass-through," only one of four bits is selected for each of the tuner's bands.

The first frequency data bit (MSD) will be the first data bit that follows the fourth band bit. The LSD data bit will be the last bit to be clocked into the synthesizer. An illustration of the band and data bit format that is expected by the digital tuner was shown in Fig. 1.

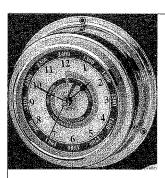
A more random method for determining the data set position for the data transmitter's switches is to find

the lowest LSD switch setting that affects the synthesizer's divide ratio. Counting the switches upward

to 19 will identify the MSD position. With a step frequency of 62.5 kHz, the lowest LSD switch will shift the oscillator frequency by 62.5 kHz. The next lower switch will have no affect on the divide ratio.

One of the most helpful hints that I can provide is to suggest monitoring the synthesizer's "lock" feature. Entering data into the synthesizer and not knowing whether or not it's responding is quite unnerving at times. Most digital tuner synthesizer IC's have a dedicated pin that goes to a logic LOW when the system locks. Building up an LED driver circuit as shown in Fig. 5 will provide visualization of what the synthesizer is doing. Connecting the LED driver, as shown, requires that a wire be soldered to the appropriate IC pin (IC pins are indicated for specific chips). This step should be avoided if you lack skill in soldering in cramped spaces. Excessive heat must be avoided to prevent damage to the synthesizer IC.

Of course, monitoring the local oscillator frequency with a frequency counter, when one is available, will provide direct feedback as to what the synthesizer is doing as well as indicate



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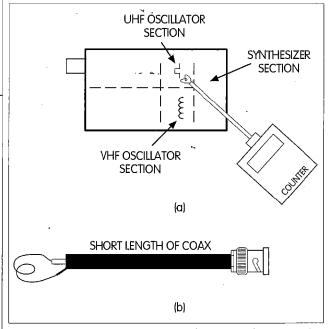


Fig. 6. Coupling signal energy from the tuner's VCO into a frequency counter. (a) Shows the approximate placement of the pickup coil. (b) Shows details of a suitable counter sampling probe. 2T insulated wire; coil diam. about 1/4"; coax type optional, RG-174, RG-58 work well.

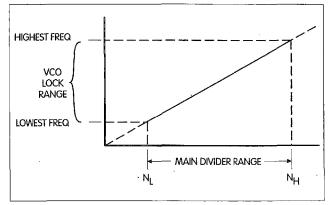


Fig. 7. VCO lock range as a function of the divide ratio of the main synthesizer divider. Dotted ends indicate ambiguity of the lock range per individual tuner.

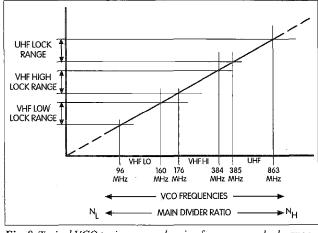


Fig. 8. Typical VCO tuning curve showing frequency vs. lock range.

the frequency of VCO operation. Coupling is provided to the counter through a small pickup loop that is placed adjacent to the oscillator coils within the tuner. Fig. 6 shows the details of the pickup loop and typical placement within the tuner. A tight coupling between the coupling loop and the oscillator coil is usually needed to achieve a "good" count.

Tuner response

One of the problems that I encountered during the initial test period was determining if and how the tuner might be responding. The use of the counter and "lock" indicator were of great assistance to me. Perhaps not knowing the band edges was the biggest deterrent.

To share my findings regarding the band limits and VCO lock capability, I've developed two charts shown in Figs. 7 and 8. The first chart is an expanded section showing the VCO tuning ramp from the lowest to the highest divide ratio for a given band. The VCO in various tuners has been set up to "lock" within the frequency requirements of the TV channels. But in some cases, the VCO will lock at a band of frequencies wider than the TV requirements, as indicated by the dotted lines representing the lock ambiguity. During initial testing, finding the near center frequency in each band provides the best opportunity of getting a "lock." Locating the lowest and highest frequency for each band is done by changing the divide ratio incrementally until the synthesizer drops out of lock.

Fig. 8 shows the typical VCO tuning curve and band by frequency. Some tuners exhibit a band gap between segments and others do not, which is a function of the lock ambiguity. The frequencies shown in the chart are the typical band limits that may be used for finding the near band center "lock" frequency during initial testing.

What's next

Parts five, six, and seven of this series on TV/VCR digital tuners will follow. Part five will provide a BASIC program that will allow the conversion of decimal frequency numbers to binary control numbers as required for tuner synthesizer control. Parts six and seven will wrap up the digital tuner discussion with a procedure for making printed circuit boards.





Skinflint Lightning Arrestors

Great protection on the cheap.

Who needs coax high voltage impulse (EMP) protection? You can bet you do, if you expect to keep that expensive low loss coax cable usable after a harmful electrical event. And this is not to mention what would happen to those super-sensitive field effect transistors (FETs) in the front ends of the new solid state transceivers.

It is good common practice to provide outer shield coax grounding at the base of a tower so that if a near miss lightning strike occurs, proper safety precautions are observed. However, there is the problem of the 2,000 volt breakdown between the inner conductor and shield of the coax cable. By the time the breakdown occurs, any

equipment left connected to it in the ham shack would have suffered substantial degrading, if not outright destruction. It is a costly problem for everyone concerned.

The first thing to be considered is the basic three classes of coax cable. The large 4,000 volt breakdown types, such as RG-213, RG-8, RG-17, and so

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Fig. 1. Gas discharge coax lightning arrestor. Notes: (1) Ensure that gas devices do not short center conductor to shell. A piece of Mylar can be inserted. (2) Use clear silicone caulk around housing to make the moistureproof connection. (3) Two 350 V gas discharge spark gaps (700 V breakdown). Ensure centered, or use a piece of Mylar drafting material as an insulator (1 μ S 700 V response). (4) Specifications — 20,000 A surge current, 10^{10} ohm insulation resistance, 1 pF capacitance, 1 mS response (100 V/ μ S).

on, are relatively expensive in today's marketplace. Then there are the smaller cables used by hams who anticipate running output powers of 600 watts (continuous) or less. Quite a cost savings can be realized with such cable, along with the very flexible nature of the product. These cables are the 1000 volt breakdown types such as RG-58, RG-59, RG-8X, and so-forth. Then there is the third type, such as RG-6, RG-174, special Teflon low loss, and so on. These types have breakdown voltage specifications of, typically, 700 volts and in some cases 200 volts. Obviously, these are to be used in the UHF/VHF ranges such as 145 MHz and 432 MHz: however, high SWR in the range of 3:1 can produce breakdown very easily in these types.

As can be seen, the buildup of EMP (electromagnetic pulse) between the inter and outer shield of coax can happen in just microseconds even with a near miss of lightning. If a strike *does* occur, it is probable that the tower will be the arrestor, and maybe you will not lose the rotor and rotor cable. Arresting of the rotor cable will occur at earth ground. Take the rotor cable and ensure that it is taped securely to the tower leg before descending down to

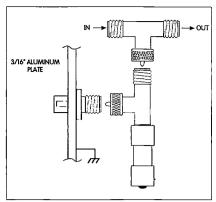


Fig. 2. Gas and gap assembly (full protection). Notes: (1) Gas discharge to protect sensitive FET devices in today's transceivers (IGFET dual gate). 700 VDC and overclamping, 10,000 amp 1 uS response. Clamping of static voltage buildup on antenna also. (2) Impulse voltages exceeding approximately 2000 VDC. Spark gap device 0.25" gap, hard clamp for near-miss lightning strike protection, for coax cable RG-213, RG-8, RG-17, etc. (3) Most transceivers have a 56 ohm 2 watt resistor across the SO-239 antenna connector to bleed off static voltage buildups.

the earth ground. This usually will provide your best chance of surviving a near miss.

The coax cable is yet another problem. The near miss lighting strike will hit the antenna and run down the coax via the shield until it finds a low resistance path to earth ground. Well, maybe you will lose fifty feet or so of coax if you have a good earth ground at the base of the tower.

The worst case is a near miss which does not run to earth ground but instead stays on the center conductor of the coax. This is a real problem, since it will mess up your nice expensive solid state equipment, should it be attached, and possibly burn "punch through" holes between the inner conductor and the shield of the coax, through the insulation material. Usually this will happen in several places along the coax until it reaches earth ground level and arrests itself.

Now, you are saying OK, what do I do to provide inexpensive protection from this problem? There are many home-made remedies, including the shorting of coax at the station when not in use.

However, I have the feeling that if any of nature's fury is ever headed my way, it can be kept outside at the base of the tower and I will sustain minimum damage. It is always a good rule of thumb to keep the tower at least 50 feet away from any structure, and well grounded to earth. A good system of center conductor protection for coax cable is going to be described here.

The first thing to consider is how fast the response is to EMP. Any device responding after about five microseconds is probably too late. I like the numbers one microsecond and 700 volts. If a device can clamp off at those parameters, it is likely that the cable will survive and it is probable that the transceiver FET will do OK, just in case you forgot to disconnect from the antenna system.

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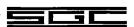


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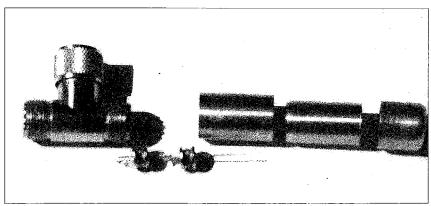


Photo A. Gas discharge EMP arrestor parts laid out for assembly.

components available from the sources given.

Another important thing to note is the incoming 120 VAC power input source. This electrical service requires that neutral and ground be connected to earth ground at the circuit breaker box that powers your residence. This National Electrical code requirement provides a nice earth ground for your ham shack equipment unless disconnected. In most cases, we just do not electrically disconnect at the ham shack when we finish operating. The coax shield is now grounded via the residence earth ground and the tower base ground, which is usually a considerable distance apart. This sets up a naturally bad situation for ham equipment destruction. I recommend some type of coax disconnect system in the shack which can be quickly engaged. A relay which disconnects the coax from equipment when not in use can be devised. Now, at least you have a chance of surviving. In any case, these are the three rules I recommend to provide some degree of protection.

Quantity	Description	Cost	Source
1	UHF coax T connector	\$2.45	Hosfelt #552A
2	Siemens B1A350	\$5.60	Mouser #444-GT350L
1	0.5" copper pipe coupling	\$0.15	Local
1	0.5" copper pipe 1" long	\$0.10	Local
1	0.5" copper pipe cap	\$0.20	Loçal
	Total	\$8.50	

Table 1. Gas discharge arrestor parts list.

Make your ham shack an island when not in use!

My three rules for survival are:

- 1. Ground the coax shield at the base of the tower at least 50 feet from entry to the shack and disconnect when not in use.
- 2. Adhere to National Electrical Code (NEMAL) rules in residential homes regarding the AC power source. Both neutral and buss ground returns go to the circuit breaker box and then directly to the earth ground rod at the box. Disconnect AC power when not in use.
- 3. Use a gas discharge device to provide 700 volts and less than one microsecond clamping and breakdown between the center conductor and shield of the coax cable at base of tower and RF earth ground.

Now, let's look at a little history on the "gas discharge" device, which is sometimes referred to as a "commgap" device. They are available in four or five different breakdown voltages, and all respond in the one microsecond range. They are similar to a neon lamp bulb. There are at least three manufacturers of these devices. One of these manufacturers retails the devices via Mouser Electronics under a catalog number of #444-GT-350-L; this is a Siemens stock number of B1A350 with a cost of \$2.80 each. Sometimes you can find these devices at flea markets for \$1.00 each if you are lucky. This source comes from the OEM folks who have production over-runs that filter into the flea market arena.

Since we now have SO-239 and PL-259 UHF-type coax connectors | Table 2. Spark gap parts list.

that have Teflon center insulators, this is what most of us use now-a-days. Some folks still use old and new military types of the N connector UG-21 and the like, which can be made to work, but with considerably more effort involved.

Now let us get down to making a couple of these devices. A small, oneinch length of one-half-inch copper plumbing water pipe is used to house the comm-gap devices. This piece of pipe is soldered into a one-half-inch copper coupling which will fit over the UHF coax T connector. Now fit the one-half-inch copper pipe end cap över the pipe and solder in place. Drill a small, one-sixteenth-inch hole into the center of the cap so that the wire lead of the comm-gap will pass through. This completes the housing, and we can move on to the attachment.

Twist together one lead of each comm-gap device to provide a good mechanical coupling, and solder. Clip the excess leads and prepare one lead of the assembly for insertion into the female center pin of the T connector. Usually, a needle-nose pliers is all that is needed to make a small loop which fits tightly into the connector. Solder this connection as quickly as possible to minimize the heat to the center pin of the connector.

Now, push the copper pipe assembly over the pair of comm-gap devices, taking the remaining lead-through the cap hole until the assembly is in place. Bend the lead and trim and solder to the copper cap end. Take an ohmmeter and check continuity between the center and outside case of the coax T connector. No shorts should exist. A little silicone RTV (clear caulk) can be used to provide a seal.

Let's check for continuity between the T connector outside case and the

Quantity	Description	Cost
1	UHF SO-239 coax receptable	\$0.75
1	0.5" coppor pipe cap	\$0.25
1	UHF T coax connector, or a gas discharge device	\$2.45
	Total	\$3.45

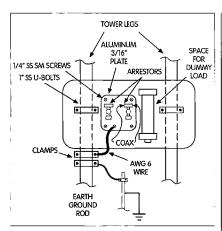


Fig. 3. Tower plate installation.

copper end cap. Continuity must exist. When attaching to the associated SO-239 connector on the antenna or tower base, ensure that the cap is facing up and the coax cable is coming out from the sides. This ensures that moisture will not be able to seep inside of the arrestor housing. You have just made a 700 volt one microsecond EMP device, for under \$8.50, which should provide adequate protection.

A quick look in your favorite ham publication will make you aware of the cost of commercial versions in the \$50 range. These devices have no frequency or RF power limitations. The usable SWR range is about 7:1, which is well beyond any usable antenna system specification. If you are over 3:1, you just do not have a usable system!

Spark gap lightning arrestor

Now that we have the EMP protection

Quantity	Description
1	24" x 12" x 3/4" CDX ply, coated with shellac and spray enamel paint
4	1/4" x 1/2"L SS sheet metal screws
2	1-1/4" x 2" SS U-bolts
2	Gas discharge spark gaps
3	Ground rod clamps
i	8' ground rod
1	#6 AWG lug and bolt
2	1' #6 AWG solid copper wire
1	3/16" thick 8" x 8" aluminum plate

Table 3. Tower plate parts list.

between the center conductor and shield of the coax taken care of, it is time to consider the direct lightning strike possibility. This means catastrophic breakdown and failure of gas discharge and coax cable. We need to ensure that most of the strike will be conducted directly to the earth ground system. Remember, we want the shortest and straightest path to earth ground.

The spark gap will ensure that voltages exceeding 2,000 volts for a period beyond the one millisecond time frame will have a direct path to earth ground. This can be done with a one-quarterinch air gap between the shield and center conductor. Here's how I do this at this OTH.

See the Fig. 4 (b) side view for the assembly details. This is done simply by using a good SO-239 coax receptacle, UHF-type, with the Teflon center insulator and the nickel or silver plated shell. Purchase a one-half-inch copper pipe cap from the local hardware store. Attach it to the back of this SO-239 with clear 100% silicone caulk. Ensure that there is continuity between the copper cap and SO-239 shell. Allow time for drying, and then mount to an aluminum ground plate as follows.

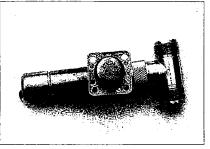


Photo B. Final assembly — gas discharge EMP arrestor and spark gap unit.

At this OTH, we use a 24- x 12-inch 0.75-inch-thick CDX plywood piece which has a couple of coats of shellac and a couple of coats of enamel paint to provide a tower base mounting system. I use a small piece of three-sixteenths-inch-thick aluminum stock to mount all the coax connections on, and then one-quarter-inch stainless sheet metal screws in the four corners to mount to the plywood base. This assembly is then mounted to the two tower legs with U-bolts (stainless are good!) to provide a really nice looking transition point.

On this aluminum plate, mount a copper lug with AWG #6 or better solid copper wire to a leg of the tower. I always use anti-oxide grease (copper

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to aluminum) when matching these two metals. The grease is available at any electrical supply house. You could use aluminum wire and avoid this problem.

Then purchase an electrical NEC-approved ground rod and two ground clamps to make the connection between the tower leg and the ground rod. Again, make sure to use AWG #6 or larger solid copper wire. Also, if the tower is not aluminum, ensure wire connects to both of the ground clamps.

Now you have a good, safe RF ground for your radio station. This is NOT to be connected to the electrical grid power system. Keep electrical power and RF grounds separate if AC power neutral and ground returns are tied together. Current traveling on the return neutral may like your RF ground better than its own, and real trouble begins.

For the experts, yes, I am aware of the National Electrical Code and its safety issues. A ground rod in the earth is considered to be an acceptable and required safety ground by the NEC.

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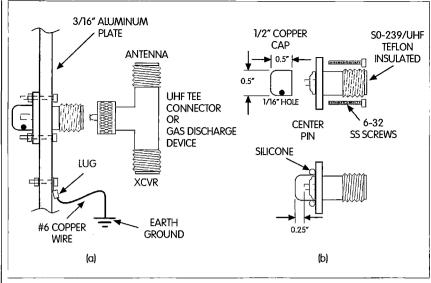


Fig. 4. (a) Spark gap lightning arrestor assembly. (b) Construction details. Notes: (1) SO-239 is silver or nickel plate. (2) Copper plumbing 1/2" cap. Small 1/16" vent hole in bottom side (face ground). (3) Physical earth grounding.

The use of one for AC power and three for antennas is an example of the inconsistencies. It is recommended that an AC switch and relays be used to disconnect and isolate your power source when the station is not in use. Unplug your station!

It is a good idea to put a large MOV device across the 120 VAC source to ensure that the ills of the power grid do not eat your expensive electronics when you are using your station.

Use common sense!

Now, you have gas discharge devices for static voltage buildup problems and near miss lightning strikes, and a spark gap device for the really wild things that nature can send your way. The required safety and earth ground requirements have been met with the tower base aluminum plate assembly, and we are now interested in how the coax cables are to attach to all of this.

Well, the UHF T connector takes care of all of that. Just cut the coax cable and attach a UHF-type PL-259 male plug to each end, and attach to the two female ends of the T connector. Please use a good grade of PVC electrical tape to weatherproof the PL-259s. You are now both safe and efficient. Play it safe!

Sources

Mouser 958 N. Main St. Mansfield TX 76063 1 (800) 346-6873 (Fax) 1 (817) 483-6899 [www.mouser.com]

Hosfelt 270 Sunset Blvd. Steubenville OH 43952-1158 1 (800) 524-5414 (Fax) 1 (800) 524-5414

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Angel Voices

This was no ordinary beam tuning experience.

June in Seattle, Washington, is normally the beginning of summer, and the days are usually sunny and warm. It was 1960, and my ham buddy Jerry W7IDI and I were getting our plans ready so that we could tune Jerry's two meter beam antenna that he had purchased at a flea market. The beam had already been mounted at the top of Jerry's fifty-foot self-supporting tower. The beam used a "gamma match" for loading.

wo hams were required to properly tune the antenna, one at the top of the tower and one on the ground adjusting the "rig." It was decided that Jerry would stay on the ground, since his left leg was still healing from an earlier auto accident. I would be at the top of the tower adjusting the gamma match, which had two adjustments — one was a shorting bar, and the other a variable condenser.

The only tools that I would need would be a crescent wrench, and a flat-bladed screwdriver. The tuning condenser had a lock nut and splined housing over the rotating shaft, which kept the shaft from turning when adjustments were not required.

We had tried for some time to obtain a climber's belt to support the one who would be up on the tower. However, we had no luck in finding anyone who was willing to loan us theirs. It was decided to go to the local hardware store and purchase a seven-foot length of 5/8-inch hemp rope to replace the climber's belt.

When the day arrived, Jerry showed up at the front door of my parents' home and picked me up. We drove the five miles to Burien, where the hardware store was located, and purchased the required hemp rope.

When we arrived at Jerry's house, we started setting everything up. I took a card table outside to the foot of the tower and set it up about eight feet away from the base, while Jerry brought the transmitter. I returned to the house to get the receiver. Jerry returned to get the one-hundred-foot extension cord, and started paying it out from the house. When he was finished

"Bill, hold on to the tower and check your rope!"

putting out the extension cord, he returned and got the test equipment.

The two meter beam with its attached coax had been set in place previously, waiting for the day that we could tune the antenna.

Jerry had the transmitter, receiver and SWR bridge hooked to the TR switch (a manually operated transmit-receive switch was used in those days), and a ground attached to the base of the tower, and all of the equipment on the card table to prevent electrical shock hazards. It looked like everything was ready to go.

The last thing that we did was to examine the rope, because I would be leaning out from the tower with that rope around my waist, and that rope had to support my weight. The rope was in perfect condition. Folding it and pulling the loop end through my belt, I got a screwdriver and an eightinch insulated-handle crescent wrench from Jerry. Then I started climbing up the fifty-foot tower.

When I had climbed to within two feet of the top, I looped my left arm through the tower and pulled the rope off of my belt with my right hand. Carefully, I pulled the rope until I was able to get a hold of the end of it, and feed it through one side of the triangleshaped tower, across and out the other side, so I could hold the end in my left hand. Twisting my body to the left, I reached around with my right hand and retrieved the free end of the rope and pulled it around my body. Then it was on to my left hand, where I carefully tied a double square knot, square knot on top of square knot, and placed the double knot on one of the angled sides.

The vertical supports of the tower were made of large angle iron, with smaller angle iron for the horizontal support, all of which were heavily galvanized, so that the edges of all of the angle iron were soft and smooth. Had there been sharp edges on the angle, I would have had to put something between the rope and the tower where they touched.

After I tied the knot and set the rope across my back, I tested the rope as I carefully leaned out from the tower while holding on to the tower with my hands. I bounced my body several times to make sure that the knot was securely fastened before I let go of the tower and stood securely in place. I then climbed up two more feet so that the rope would be around my waist just above my belt, and I was able to reach up with the wrench and loosen from its splined shaft housing the nut which held the Rotor shaft firmly in place. I yelled down to Jerry to go ahead and tune up.

Plugging in the equipment, and picking out a clear frequency on his receiver, Jerry fired up his transmitter into the antenna, and checked the SWR. It was way off. Next, Jerry asked over his mike if the frequency was clear, and, hearing nothing, gave his call and explained that we would be testing on this frequency for the next half hour. Next, Jerry yelled up to me, "Mesh the plates, Bill."

Inserting the screwdriver into the slotted end of the rotor shaft, I turned the rotor shaft until the rotor plates were fully meshed with the stator plates. I let Jerry know that all was ready, and he retuned his rig and took the reading. "Give it a small tweak," Jerry yelled.

I inserted the screwdriver and turned the rotor shaft slightly. Jerry retuned his rig again and said, "Try it again, Bill." I inserted the screwdriver into the slot and turned it a little more. "That's looking a lot better," Jerry said. "Turn it some more." Again I repeated the process as before, and Jerry took his reading. Back and forth we went, trying to find the best setting for the lowest possible SWR reading.

As I reached up to insert the screwdriver into the slot of the rotor again, I heard a voice call out to me. It was about three feet above me, and about six feet in front of me. It called out, "Bill, hold on to the tower, and check your rope."

Stunned, I looked up into the clear blue sky between the elements and the boom of the beam, in the direction of the voice that called out to me, but there was no one there. I felt a prickly feeling all over my body. "Jerry," I called, "did you just call me?"

Jerry said, "No."

"Well, someone just called out to me and it sounded like it was coming from the sky in front of me."

Jerry said, "You're just hearing things, Bill — let's finish this up. Make that adjustment for me."

Again I reached up and turned the rotor shaft a small tweak, when the voice called out to me again — only this time it was more insistent, "BILL, HOLD ON TO THE TOWER AND CHECK YOUR ROPE," it said.

"Did you hear it that time, Jerry?" I called out.

"What did it tell you this time, Bill?" Jerry asked.

"It told me to hold on to the tower and check my rope."

"What did I tell you before, Bill? Now let's finish this project."

Leaning out on the rope, away from the tower, I felt very secure. The rope was firm, and at the angle I was leaning at, it even dug into my flesh a bit where it went around my waist just above my belt. I inserted the screwdriver into the shaft on the tuning condenser and gave it another small tweak. "OK, Jerry," I yelled. Jerry made some more adjustments and decided that I needed to climb up higher and readjust the shorting bar by moving it two inches farther out.

Before I could start to climb higher up on the tower, the voice sounded very angry and gruff this time: "B-I-L-L!!! HOLD-ON-TO-THE-TOWER-AND-LOOK-AT-YOUR-ROPE-RIGHT-NOW!!!"

"Jerry, did you hear it that time? It sounds very angry." I said.

"I give up, Bill. I guess this won't stop until you look at your rope and see that nothing is wrong with it, and we can finish this up," Jerry said.

Stepping back down two feet from the top of the tower, I looped my left arm through the tower as I had before, and carefully pulled the rope around with my right hand, feeding it through my clenched left hand that was sticking out of the inside of the tower. When I got to the point that was across my waist, I stopped.

What I saw gave me a sudden chill. The point at which the rope lay across my waist behind me, that had supported all of my weight, was cut all the way through as if a scalpel had cut it. The cut was clean and even, with no raggedy ends or strands sticking out. Just one, single, hair-thin piece of hemp held the two ends from separating completely.

"Jerry, you've got to see this rope right now," I said.

Standing on the ground, Jerry yelled up to me to climb down and show him what the matter was with the rope. Very carefully, I folded the ends of the rope so that I could keep the ends in the same position, without separating the little strand of hemp. I placed the rope in my mouth and held it with my teeth. I untied the rope and carefully placed the rest of it over my right shoulder before starting-back down the tower. I wanted the free ends to be behind me where I could not step on them as I descended from the tower.

When I reached the ground, Jerry was there waiting for me. I carefully took the rope out of my mouth and handed it to him. Jerry stood there for a moment with his mouth hanging open.

Holding the free ends of the rope together in his right hand, about three inches below the cut, Jerry asked me, "How did you do this, Bill? Turn around and let me see your back."

I turned slowly around and Jerry eyed me very carefully. As I turned, I lifted my shirt so that he could see where the rope had rested against my waist, which left a red welt where the rope had dug into flesh. The only other tool that I had in my back pocket was the red insulated handle of Jerry's crescent wrench, which was sticking out of my right back pocket a few inches. I did not carry any other tool or

Continued on page 62

Introducing the Perfective 1

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ou know, what instigated this whole project was a student's comment in class one time. I was lecturing on the use of the milliammeter and explaining how the internal resistance of these devices often causes bad readings in a circuit. I commented that when we all get to heaven and St. Peter issues us our little mA meters, they will be PERFECT, with no internal resistance or resulting voltage drop.

The students took this with a sigh, but one in the back looked worried. I asked him what was wrong, and he replied: "Mr. Lorfin, I wonder if YOU will ever get to see one ..."

Well, I thought about this and realized how true that might be. So I decided that I had better invent one for myself while there was still time, if I was ever going to behold one's beauty.

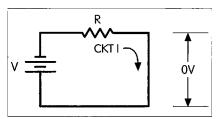


Fig. 1. Representative circuit showing current flow.

This project is the result.

P.S. The student made an A in the course.

In search of perfection

Sometimes, a circuit may be working perfectly until you make a current measurement, and it may not be working so well while you are making the measurement. Also, from the results of the measurement, you might mistakenly think that there is a defect in the measured circuit when there really is not one. This has been quite a problem for me and others in the past.

To fix it? Well, it was hard to imagine a standard DC-AC milliammeter that has zero measuring resistance and zero burden voltage. However, one day a thought came to me that resulted in this design, a design that has overcome this fault and resulted in the "Perfective Current Meter."

This instrument is not difficult for anyone to build. I built the prototype shown here for about \$60. Let me hasten to add that this was going first-class, using new parts not obtained as cheaply as could have been.

In Table 1, I've listed the specified internal resistance and burden voltage

values for one commercial DVM. In Table 2, we see some typical current readings, taken with random resistances and voltages, using the meter in Table 1 and the Perfective 1 Current Meter, or Perfl. Note that the errors greatly exceed the rated accuracy of any digital current meter. Of course, in many circuits the error is not this gross; however, an error is always there, and most people tend to consistently fail to compensate for it when making current measurements.

In meters using protective fuses, these fuses can add to the internal resistance of the meter in addition to the normal shunt resistance, especially if they have not been selected so as to have minimal resistance.

One idea in use to reduce this problem is to use lower values of shunt resistors

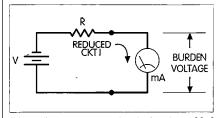


Fig. 2. Representative circuit showing added circuit resistance from standard mA meter.

Range	Ohmic Value	Burden Voltage (full scale)
4 mA	200Ω	800 mV
40 mA	20Ω	800 mV
400 mA	2Ω	800 mV

Table 1. Specified internal resistance and burden voltage values for one commercial DVM.

Applied Volts	Ohms	Ohms I w/Meter		
7.5	25	280	306	
10	125	82	84	
2.5	15	142	166	
5	15	295	340	

Table 2. Table 1 readings versus Perf1 readings.

Frequency	PP Burden Voltage	
DC	Adjustable to zero	
100 Hz	Virtually unmeasurable	
500 Hz		
1 kHz	Approx. 0.5 mV peak,	
3 kHz	- Or less	
6 kHz	<u></u>	
30 kHz	Approx. 20 mV peak	

Table 3. Burden voltage for DC and AC measurements using Perf1.

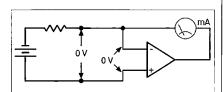


Fig. 3. Representative circuit showing perfective mA meter with zero burden voltage.

and amplify the shunt voltage. This is effective, but does not solve the problem as neatly as the approach used in this instrument.

The cited example of errors is common among all standard commercial meters, not just the one described.

This instrument, when used with a DVM or any other type of current meter, overcomes the problem to near perfection. DC burden voltage can be Table 4. Parts list.

				Approx. Cost (S)
l1	LED lamp	Red fixture	276-270	2.20
12	LED lamp	Green fixture	276-271	2.20
1	Cabinet	3 x 5-1/4 x 5-7/8*	273-253	7.00
T1-4	Sets, binding posts	Nylon banana, individual	274-662	4.00
T5, 6	Binding post	Chassis mount, dual banana	274-718	3.50
6	Spade lugs	#6 terminal	64-3043	.25
SW1	Switch	SPST toggle	275-612	2.79
1	Tie point	2-point with ground	274-688	.25
1	Line cord	6 ft., 3-wire	278-1258	2.99
1	Grommet	5/16*	64-3025	.10
Q1	TIP 120 or equiv.	NPN Darlington, TO-220	276-206B	1.29
Q2	TIP 127 or equiv.	PNP Darlington, TO-220	RSU11371101	1.69
IC1	Op amp	LM358 low power	RSU11929072	.89
BR1	Rectifier	1.4 A bridge, round case	276-1152	1.19
BR2	Rectifier	1 A bridge, dip	276-1152	.99
D1, 2	 -	LM385 n.a. Radio Shack	270-1101	.59
D1, 2	Rég. diodes	1N5221B 2.4 V zeners	RSU11673431	.89
	or		M3011073431	
D0.7	or	Any zener up to 4.3 V	070 1400	
D3-7	Diodes	1N4000 series	276-1102	1.25
D8	Diode	1N34 germanium	276-1123	.11
C1-4	Tantalum	10/16 VDC	272-1436	3.60
C5	Electrolytic	10/35 VDC radial	272-1025	.59
C6	Ceramic	0.01/500 VDC	272-131	.49
C7-8	Cetarnic	0.1/50 VDC	272-135	1.00
C9-10	Electrolytic	10/35 VDC axial.	272-1013	1.20
C11-12	Electrolytic	3300/25 VDC radial	RSU11935368	2.60
R1, 4, 5, 13		1k	271-1321	.40
R2		470	271-1317	.10
R3	:	10k	271-1335	.10
R6 if used	Carbon film,	180	271-1110	.10
R7	1/4 W, 5%	220k	271-1350	.10
R8		10k 15-turn pot	271-343	1.49
R9~10		4.7k	271-1330	.20
R11-12		100	271-1311	.20
R14		56	RSU11344637	.10
F1	Fuse	Miniature 0.25 A PT	RSU11322864	.89
8	Nuts, bolts	Assortment	64-3011	.20
2	Standoff	1/2" #6 hole for main board	64-3024	.20
2	Standoff	1/4* #6 hole for PS board	64-3024	.20
1	Transformer	12 VCT @ 0.45 A	273-1365	4.99
1	Sonic device	Radio Shack	273-074	2.99
2	Heat sinks	For transistors above	276-1363	1.80
1 ea.		Main circuit and PS PCB		
APPROXIMATE TOTAL			\$59,00	

trimmed to zero, resulting in zero ohms internal resistance also. The burden voltage for DC and AC measurements using this instrument is approximately as shown in **Table 3**.

These measurements were taken at a current of 0.1 amp. Note that the frequency range here exceeds that of the standard DVM. Any existing burden voltage varies linearly with the amount of current; consequently, it is less for smaller currents being measured. It should be noted that the above burden voltage was measured at the SENSE terminals, which does not take into account test lead and connector resistance, etc. — more on this later.

How it works

The operation of this circuit is based upon the "burning desire" of an op amp to keep its two input terminals at the same potential. A feedback path from the op amp output to the inverting input gives an op amp capability to do this.

In this circuit, the op amp is connected as an inverting amplifier (see Fig. 3). The feedback resistor is the readout meter. The input resistor is the intrinsic resistance of the circuit into which the op amp is inserted. In order to keep its two input terminals at the same potential, the op amp provides output current of a magnitude to match the circuit current, but of opposite polarity; this is standard inverting.

Amplifier operation

The above results in an interesting situation — the two input terminals of the op amp appear to be shorted together; the circuit being measured does not realize that the op amp is even inserted into it. A low frequency op amp was specifically used here to greatly reduce any tendency for the circuit to oscillate while still providing sufficient bandwidth for the circuit. A drawback to this circuit is that the opamp must be able to provide the same current as is flowing in the circuit being measured, hence, the power transistor output stage and the relatively heavy power supply. For current ranges within the capability of the op amp itself, no transistor boost would be

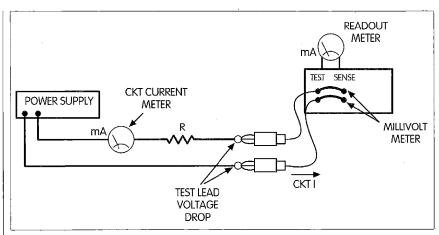


Fig. 4. Testing for proper operation. See text.

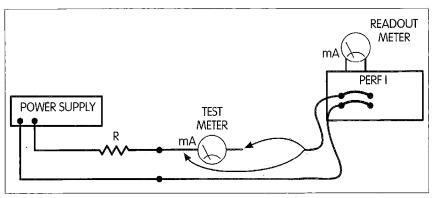


Fig. 5. Demonstrating the lack of added circuit resistance afforded by the perfective mA meter. See text.

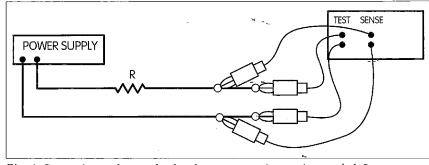


Fig. 6. Connecting so that test lead and connector resistance is canceled. See text.

needed, and a lighter supply could be used. The power supply voltage can be quite low, in that the supply voltage only needs to be high enough to overcome the small voltage drop of the readout meter and to operate the op amp itself.

The transistors (Q1 and Q2) are Darlington types for large current gain. Bias for the transistors is provided by D5 through D8. Note that D7 is a germanium diode. This combination of diodes resulted in the best biasing for

good AC output capability and proper idle current. D5 and D8 are mounted on the heat sinks to provide transistor bias stability due to temperature changes occurring with transistor operation. R14 and C6 provide compensation to prevent the circuit from oscillating.

Note that the readout meter is connected from the transistor emitter junctions (the output, T6) back to the inverting input of the op amp (through T5, T1, jumper, T3, and R5 to pin 6) and that the noninverting input of the

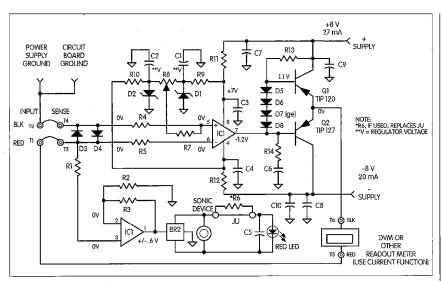


Fig. 7. Schematic of complete unit, less power supply.

op amp (pin 5) is at power supply ground (through R4, T4, jumper, and T2). The circuit being measured is connected to T1 and T2 through the test leads.

The sense terminals, T3 and T4, are the actual points that the op amp will hold at equal potential. They are normally connected to T1 and T2 with

short jumpers. They can be disconnected from T1 and T2, and be connected with separate leads to the point where the test leads are connected to the circuit being measured, thereby canceling any voltage drop in the test leads.

Op amp offset adjustment, (+) and (-), is provided by two regulated

voltages applied to the 10k pot, R8. Adjustment of R8 will apply any desired amount of offset voltage to pin 5 through R7. Regulation of these voltages was done in the prototype using the LM385 regulators. If these are inconvenient to obtain, any type of regulator device will suffice, provided that it will operate satisfactorily from a 5 volt source. See the parts list, **Table 4**. If a different level of regulated voltage is used here, you might desire to change R7 — use about 100k per volt of regulated voltage for ease of adjustment.

Since the circuit should normally have virtually no voltage present across the input terminals, voltage here indicates that there is a problem of some kind, such as an open readout meter circuit. Warning of this, or other problems, is provided by the second section of the op amp package. This section amplifies any voltage present here, turns on the red panel lamp indicating a circuit malfunction, and activates the sonic device.

The sensitivity of this warning circuit can be adjusted by the value of

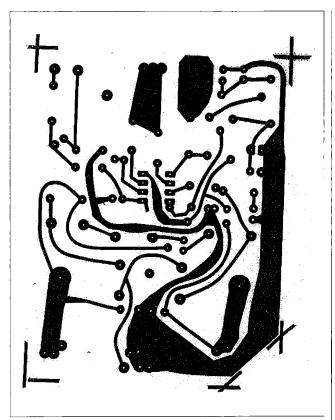


Fig. 8. Main PCB, foil side (100%).

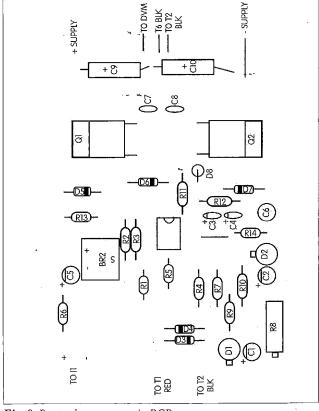


Fig. 9. Parts placement, main PCB.

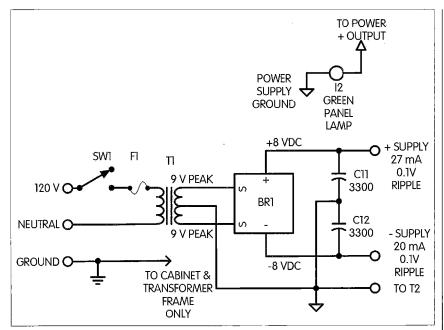


Fig. 10. Power supply schematic.

R3. R6 is necessary if a standard LED is used. It would be jumpered for LEDs with a built-in limiting resistor. The small sonic device was soldered directly to the LED pads on the bottom of the circuit board, being mounted so that it points out from the side of the board. Two diodes, D3 and D4 at the input terminals, offer a path for current to flow (but with voltage drop) from the measured circuit, if this instrument is turned off or is otherwise inoperative.

The power supply used here is good for about 0.5 amp of current; however, a heavier supply will permit a much

greater current measurement, as the output transistors are rated for 5 amps. The particular heat sinks used here would not be suitable for more than about 1

Fig. 11. PS PCB, foil side (100%).

amp of steady current flow with the supply voltage of 5 volts or so. This supply voltage is sufficient to operate the circuit while resulting in minimal heating of the output transistors. For this reason, it is suggested that whatever changes might be made, you should not use a supply voltage higher than this. Using the power supply featured, current measurements above approximately 0.5 amp can result in lowered power supply voltages and increased ripple, which will most likely cause the circuit to malfunction.

Building the circuit

Note that all parts can be obtained from Radio Shack except the circuit boards. There are no parts used here that are critical as to tolerance. All parts listed can be substituted with equivalents. Construction is straightforward.

Connection of some wiring is critical in order that current flow does not contribute to offset voltage:

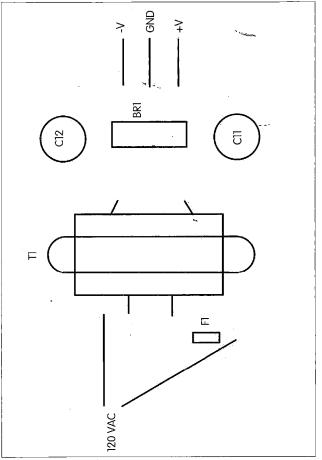


Fig. 12. Parts placement, PS PCB.

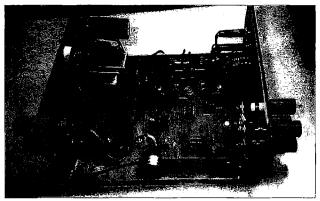


Photo A. Inside view showing placement of boards and wiring.

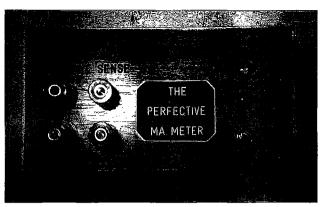


Photo B. Front panel view.

- A. Power supply ground wire directly to the BLK INPUT TERMINAL.
- B. Circuit board ground wire connected as above.
- C. RED INPUT terminal (T1) directly to the RED METER terminal.
- D. RED SENSE terminal (T3) to the INVERTING op amp input.
- E. BLK SENSE terminal (T4) to the NONINVERTING op amp input.
- F. WHEN MOUNTING THE POWER SUPPLY BOARD, BE CERTAIN THAT THE GROUND FOIL IS NOT CONNECTED TO THE CABINET. INSULATED STANDOFFS ARE REQUIRED HERE.

The schematic shows these connections. The cabinet should be isolated from the circuit ground but connected to AC ground (earth ground, third wire) along with the transformer core. Connection of the various wires to the main circuit board was accomplished using small wire-wrap pins soldered onto the board. It is a good idea to bend the pins at a right angle for an eighth of an inch or so where they fit onto the board pad, to increase solder-

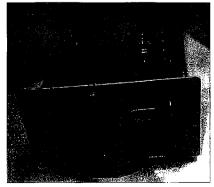


Photo C. Rear view.

joint strength. Female push-on connectors that came from an old type "D" computer plug were soldered to the wire ends. A short piece of snug-fitting shrink tubing around the push-on connectors is in order.

Being able to separate the board from the wiring is wonderful, should you have to remove it from the case. Due to the tight fit of everything inside the cabinet, you must carefully consider the mounting of all items before drilling holes! The circuit board is mounted by two screws on 3/8-inch standoffs. The hole positions on the board are shown on the artwork. I might mention here that the standard spacing for the banana jacks used on the front panel is 0.75 inches. This is compatible with the double banana plugs that you might desire to use.

I suggest that all cabinet panel items and the power supply board be mounted before the main board is positioned inside the case. If you mount the main board first, it will, for sure, conflict with some of the other cabinet-mounted items when they are put into place, because of the tight fit. The on-off switch can conflict with the lower right-hand corner of the circuit board very easily, so a bit of this corner was cut off at a 45-degree angle (see artwork) to ensure proper clearance. To say the least, very carefully consider the mounting of all items before drilling holes!

The AC cord was brought in through a grommeted hole. A tie wrap around the cord on the inside, tightened close to the grommet, is used as a strain relief. The neutral and hot wires are connected to the terminals on a twoterminal tie point. Ground wire is bolted with a lug to the case. Small wires were connected from the tie lug to the transformer primary and on-off switch (hot wire). Be very careful with routing, insulation, and connection of the hot wire. I always place a piece of shrink tubing around the on-off switch to cover the hot wire terminals. A large

IC1 Pin #	Volts					
1	±0.6					
2, 3, 5, 6	zero					
4	-7					
7 * "	-1.2					
8	+7					
D1, D2	Equal to regulator voltage					
Q1 collector	+8					
Q1 emitter	zero					
Q1 base	1.1					
Q2 collector	-8					
Q2 emitter	zero					
Q2 base	-1.2					
+ Power supply current drain = approx. 27 mA						
- Power supply current drain = approx. 20 mA						
Power supply ripple = 0.1 V P-P						
Power supply 0.2 V P-P	/ ripple @ 0.1 A current =					

Table 5. Voltage chart. Voltage readings taken with 10 meg input resistance DVM, T1 and T2 open, readout meter connected to METER output jacks on rear.

piece of shrink tubing was placed | around the tie point to cover it.

Test for proper operation

It would be a good idea to first read pertinent voltages as shown on the schematic to see if yours correspond. Connect the readout meter to the "METER" terminals and put it into the current function. Ranging is done by adjustment of the READOUT meter. Jumper the input and sense terminals together as shown on the schematic. Apply NO input. Now check your voltages against those listed.

Connect a variable DC voltage supply through about 50 ohms to test leads going to the INPUT terminals (see Fig. 4). A millivoltmeter or oscilloscope can be used to record millivolts at the SENSE terminals. Apply a steady current of 200 mA through the resistor to the test leads. This 200 mA from the supply should be indicated by both milliammeters. These two readings should agree. Adjust the 10k pot, R8, for zero millivolts at the SENSE terminals. Vary the current from 0 to 400 mA, and note that the SENSE voltage should not vary by more than approximately 0.1 mV, max. This variation is the input signal voltage to the op amp; this will vary some from one op amp to another due to differences in gain of the devices. A much greater variation of voltage here with current means that the SENSING is not proper, possibly due to incorrect wiring of the terminals. If this test checks out, you can then measure the millivolts present at the test lead clips. This will be very small and due to the resistance of the test leads and INPUT terminal connection resistance (the banana plugs). This voltage will vary with current and will be equal to the total resistance of the leads and connections multiplied by the current flow. The method of eliminating this is discussed later.

Testing for accuracy

First, obtain two digital current meters and connect them in series. Determine their comparative accuracy at different current levels. Next, connect one to the Perfective 1 Current Meter

output terminals and connect the other to read input current. Generate a current flow and compare the readings. Reverse the input polarity of current flow into the Perfective 1 Current Meter and determine comparative readings of output for the positive and negative current flow; these should be very close. You should be certain the offset adjustment (R8) is close to zero. as this will cause a difference in the above readings if not. Tests on the prototype have been within less than 1% of each other.

Demonstrating the action

Try using different values of voltage and resistance: connect the circuit as shown in Fig. 5. Take a reading on the READOUT meter. This will be the reading you will get without the aid of this instrument due to the resistance of the TEST meter. Now jump around the TEST meter as shown in Fig. 5 and note the increase in current reading on the READOUT meter. This is the true circuit current that will flow when no meter is inserted into the circuit or when you are using the Perfective 1 Meter.

This difference illustrates the usefulness of this instrument. The greatest difference will be evident when the range setting of the TEST meter is such that you get closest to full-scale reading on it.

Using the Perfective 1 Current Meter

This circuit was designed to be used with any type of current meter. Of course, to measure AC current, the meter in use will have to have this feature. Observing polarity of connection will ensure a proper polarity indication on the meter readout when in the DC function.

Normally, the SENSE terminals and the INPUT terminals will be wired together by short wire jumpers connected directly between the two. As mentioned before, the only point of connection where the burden voltage will be zeroed is at the SENSE TER-MINALS. The test leads connecting the measured circuit, as well as INPUT TERMINAL connection resistance,

will cause voltage drop (burden voltage) due to the current flow. This voltage drop has been measured at around 20 mV or so and will vary with the characteristics of the test leads used.

If you is desire to have the resistance of the TEST leads zeroed out, separate SENSE leads should be connected from the SENSE terminals directly to the point of connection of the TEST leads (see Fig. 6). This will naturally require four leads going from the instrument directly to the measured circuit. Of course, the jumpers between the two sets of terminals should be removed for this type of REMOTE SENSING. It is important that the SENSE test leads be connected to the measured circuit itself next to the point where the TEST leads are connected, not to the clips of the TEST leads. This will ensure that the TEST lead clip resistance will be zeroed out also.

A confusing problem can result from the negative leads of test instruments and/or circuits being connected together through the third-wire ground of the AC line cord. Oscilloscopes normally have their negative lead connected to the third-wire ground. Some multimeters do also. To prevent this problem, you can use a three-to-twowire adapter on the AC line cord of the offending instrument to remove this connection. To test for this, use an ohmmeter to see if negative leads are connected to the third-wire ground terminal on the AC line cord.

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More New Freeware!

With the sudden rush of enthusiasm over PSK31, some hams feared that the RTTY mode might gently slip away into the night, and for a time there were numerous converts to the warbly mode. However, there is new life being pumped into the longstanding champ of digital modes.

There were already some soundcard programs that function very well on RTTY, namely MixW and TrueTTY. I have both and they are very good.

But now you can get an absolutely free piece of well-written software dedicated to RTTY that runs under Windows and even has a version for the much maligned pre-Pentium 486 machine. I am running it successfully on my 120 MHz Pentium with 32 megs of RAM, though I am led to understand that may be as slow as the 586 processor can be expected to run the program well. Even so, with today's hungry programs, this is a nice-working, well-thoughtout piece of software that should gain a lot of followers long before this column appears.

I had heard of the MMTTY program for a couple of weeks, and everyone kept telling me how great it was, so I had to find it and give it a try. It wasn't difficult to find. It is on several sites. The best thing to do is to use one of the English sites. The one I used is listed in The Chart. The first version I downloaded had some instructions that were obviously translated and the Help files required manipulating, so I went to a little extra effort and printed the Help files separately.

That was a good idea, until a few days later when version 1.58 appeared — with excellent rewritten Help files. Some folks got together and really did a bang-up job of writing understandable instructions and put them on the VE5KC Web site. These are just about as close to perfection as anyone's instructions can ever get — and way out in front of some of the files that come from those who wrote this word processor I am using. Sometimes, I fear for the day when I finally upgrade from this "comfortable-old-shoe" version of Word and have to learn all over how to format a page.

You will have virtually no problem getting the MMTTY program set up and running. If you have been using a soundcard program, have audio cables in place to your soundcard, and perhaps the luxury of a PTT circuit (or a RigBlaster box, to do it the easy way), then the MMTTY program will install and you will feel right at home.

It took about 15 minutes from the time I started executing the installation until I was tuning a RTTY signal and making a contact. I wasn't yet proficient with the many macros you will find already programmed, but I was struggling (thrilling?) along using the program and, of course, making my usual excuses for being a little slow at the operating "because this is an unfamiliar program."

Most hams will put up with that. I have programs that I use which give me a little problem occasionally. The other day, I was telling the contact at the other end what had happened, and he gave me the best explanation for the problem anyone ever has. He said he simply called those things: "woolly buggers." I liked that. I can use it when I press a wrong key or just simply address a peculiar algorithm the programmer hasn't discovered yet.

I am finding a real advantage in having joined the MMTTY reflector, which is easily done from the download area where you download the program. I have been checking my E-mail the past several days and there is a good amount of reflector activity. There have been at least two or three good hints that make life easier for the operator with this new program. These reflectors can be very handy, at least at first, and if they get to be a nuisance, it is usually quite easy to unsubscribe. But I recommend joining, at least at this time.

The program is a little different in its makeup, as the programmer, Mako

IE3HHT, has tried to put in all the bells and whistles anyone could ever dream of asking for. You will have to agree he did a very fine job.

There is even a scope for the purists among you. This does not seem to be necessary, as there is a spectral display and a waterfall already in place, and you will soon discover you will tune most accurately with either one of the latter. The scope can be turned on and off and tweaked a bit for clarity. I read somewhere that the scope tends to slow the system a bit. That would be excuse enough to leave it off.

On a quick count, I find 29 macros available. Most of them have been pre-programmed, but you will find the author has his own personal information in many places which you will want to change to conform with your personal and station info. The editing is simple enough; and the instructions in the Help file will keep you out of trouble.

Macros are great for several reasons. I recall working a ham a while back who had just about everything he felt necessary for a successful QSO broken up into chunks and stored in the many macros in his software. Between using macros and typing ahead, he could get by without ever making excuses for his typing skills. He referred to himself as "the macro king." I felt he had a very good method. It can be difficult, even for the best typist, to look like his skills are under control at all times.

Another need answered well by macros is getting the message out with the least amount of composing, or rather the shortest number of letters, and turning it back to the other operator. The reason is that often a slight change in propagation will bring copy crashing down, especially in RTTY. So short, well-planned, exchanges do wonders for the success ratio of completed QSOs.

If nothing else, I like to have, in addition to a CQ message, and answer-CQ, a turnover, a BTU, a name and QTH and an SK macro ready. The big advantage there is it is so much easier to let the computer recall the other station's call and insert it at the right time. I can type my own callsign easily, but remembering and typing someone else's is usually time consuming and brings the orderly process of "conversational typing" to a grinding halt.

Now-a-days, most programs will insert the other station's call and the operator's name automatically in the macros and we look pretty smart. I like that (things that make me look smart, that is).

As I write, I have the program running and have just made two contacts in midcopy here, and both of those were hams using the MMTTY software. Both were marveling how intuitive and easy the setup is. I think the ending phrase after that bit of news is, "that says it all."

As you explore this program, you will discover that a full-fledged log is included, with the capability to export to an ADIF file that you can import into your favorite logging program. You will also find complete instructions for logging in the Help files. Very nice.

Something else you will find on the MMTTY download site is a little 6-page primer called "RTTY Basics." This is a well-written, informative read that gives you a good overview of what is different about the mode. Worth reading for newcomers and a good refresher for any old-timer. It not only covers some basics we all should know but also gives a few specifics as to how the MMTTY handles certain classic RTTY anomalies.

You will find this file as you pass into the "Help" region of the URL. I thought it was a download file, but I had to print it from the site. It is not very big, about six pages, but it contains a lot of good info worth having around.

Some updates are in order. The URLs listed in The Chart have a way of becoming dated. I just received word from a reader who "archives" his 73 mags and refers to them a little later. It seems he was reading a January (this year, I think) issue and needed help to look up the RCKRtty software URL. I know I had reviewed it, and there was a problem accessing the Web site.

I expected the worst, but went to my copy of The Chart and copied and pasted it to the browser and all is well, except that there is a reference to a new URL and it looks like there should not be confusion with the new address. It is edited in The Chart now.

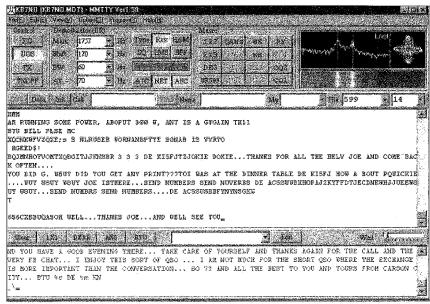


Fig. 1. Screenshot — MMTTY freeware for RTTY. This is version 1.58. By the time this reaches print, there may be many changes. This is the start of the really fine Help files that do their job. The program runs on Windows and reminds you of the PSK programs in that so much is automatic. The setup and operation are very intuitive. Many of the macros are predefined. You will need to edit them, but the Help file will lead you well. The tuning screen is displaying the "scope," which can be optimized or removed entirely. I found that tuning was a snap, and the AFC worked well to keep the signal fine-tuned. The program takes advantage of the DSP in the soundcard and the "BPF" button at the top stands for Band Pass Filter, which can be tweaked from the "Options" menu. You will notice that log entries do not seem to contain a "QTH" box. If you click on "Name," it will change to accept a QTH entry. I conversed with users on the air who were working their first RTTY, as well as to those with "green key" experience, and all agreed it was an exhilarating ride. The copy compares at least favorably with any other method anyone had used. It looks like "everyone is doing it" and Mom doesn't object. Quite a success story!

I had forgotten, but the author of RCKRtty promises a program for the MFJ-1278 (along with other popular TNCs). The MFJ is difficult to find aftermarket software for, and since I do not have one of the magic little boxes, I asked the inquiring ham to let me know how he liked the package. I know there are others who are disgruntled with the factory package and have asked. So we shall see, and I will let you know what happens.

At the same instance, I was informed that the N1RCT Web site no longer lists RTTY software. I know there are other listings on the Internet and have promised to look around. It so happens there is a link to a listing of soundcard communications software for most modes we discuss here on the URL where you will download MMTTY. So, for now, that is an excellent place to browse for your software needs.

Some of you may have been as much in the dark as I have been. I have been using a small, by today's standards, monitor (13" diag.) and still am, but I have accomplished an improvement. And you may be able to do the same thing.

Here was where the problem became apparent. As you recall, I was testing, using and loading the upgrades for WinWarbler. That was going well, until the last few updates stopped displaying about one inch of the right side of the panel on my monitor.

I fiddled and adjusted with no success and asked Dave, the author of the program, for advice. It seems this old-fashioned setup comes normally with a 640 x 480 pixel display. If the monitor is a true SVGA, as this one is marked, then there is a choice to go to 800 x 600 display.

I made a hurried attempt at this and, sure enough, it could be accomplished, but I was lacking some tweaking to get the results I expected. Dave chided me a bit for my lack of patience and I got back to it in a few days, and I am now using the 800 x 600 display option that was available all the time with the video driver that came with the machine. Maybe not originally but at least after some upgrades. This is about a 1994 monitor, maybe 1993, so I suppose I am lucky to get it to do the job.

With the new display mode, the

WinWarbler displays perfectly and a problem I was having with the program totally disappeared. That was the inability to select text for the QTH box. Selecting seemed to be a very delicate operation and you needed to avoid scrolling during the selection. All that problem stabilized.

Plus, of course, the entire display of the WinWarbler is available. I suppose I should mention that those who are monitor challenged such as I am, will need to make whatever provision is necessary to attain the 800 x 600 display for that program.

I found another program that this new found display helps, and that is MixW. If you check on the MixW setup, you will find display options that just do not quite work the way you expect if you are running the 640 x 480 mode. When you make the change to 800 x 600, and expand the program display, it is like a whole new program.

I thought at first that the word processor display was going to take a hit. It does, but not a serious one. The display will expand to fill the monitor, and the only real problem is that the 12-point type font looks more like 10-point. That could be changed by increasing the font size, but it is readable after you get used to it.

I suggested that Dave might put some instructions with the WinWarbler software that would help those in need of the change. He said, and I believe it, that there are too many variations of the operating systems to allow a hard and fast set of rules for tweaking the display driver.

What worked for me may sound like Greek to many of you. I brought up the Control Panel and selected Display and then selected Settings. On that panel I was able to manipulate the display and get it to apply. However, as I said, it wasn't satisfactory the first time. Probably about the third attempt, the change stuck and all that was left was to adjust the knobs on the monitor to center the "picture."

My guess is that you will either have to find instructions, experiment as I did, or ask your local "guru" for help. It is definitely worth the effort if you can do it without spending the bucks for the large monitor and proper driver. And, if 500 or so bucks does fit into your budget, then you would surely enjoy the largest monitor you can afford.

A lot more can be done, such as displaying screens side by side for some of the more complex setups. At this time, if I want to run two simultaneous displays, it is necessary to display them one on top of the other and switch back and forth. Anyway, for whatever it is worth, these computers keep doing more fun stuff if you just throw enough money at them.

If you have questions or comments about this column, E-mail me at [jheller@ sierra.net]. I will gladly share what I know or find a resource for you. For now, 73, Jack KB7NO.

Source for:	Web address (URL):					
Mix W Soundcard program for PSK31, RTTY, new modes, MTTY, FSK31, more	http://tav.kiev.ua/nick/my_ham_soft.htm http://users.nais.com/jaffejim/mixwpage.htm					
MMTTY New RTTY soundcard freeware plus links to other software	http://www.geocities.com/mmtty_rtty/					
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PSK31 — Free — and much PSK info	http://aintel.bi.ehu.es/psk31.html					
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Interface Info for DIY digital hams	www.qsi.net/wm2u/interface.html					
Site with links to PSK31 and Logger 7. Also Zakanaka and scope program	www.chreniclenetworks.com/~dwrm/logger-zakanaka.htm					
PSKGNR — Front end for PSK31	www.al-williams.com/wd5gnr/pskgnr.htm					
Digipan — PSK31 — easy to use — new version 1.2	http://members.home.com/hteller/digipan/					
TAPR — Lots of info	www.tapr.org					
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Timewave DSP & AEA products	www.timewave.com					
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DX4WIN Now Available with PSK31 Functionality

One of the premier DX logging programs has just been made even better. DX for Windows, a product of Rapidan Data Systems in Virginia, now gives the DXer the capability of real-time PSK31 operation from a window within the program itself.

It is no longer necessary to manually enter critical QSO information, or operate a separate program while working a station on PSK31. Now, a couple mouse clicks and keystrokes are all that are necessary to operate this exciting new mode in a manner that is fully integrated with your "e-log."

Beyond PSK31 functionality, DX4WIN is a multifaceted program that allows you to place your log on your home PC or laptop, while maintaining a connection to a DX cluster via AX25 packet or the Internet. It also provides the capability of making QSOs happen either with a CW keyboard, or via a separate RTTY window. Oh, and do you have one of the new computer-controllable rigs, or an antenna rotator? It will interface with those toys as well. Here is an alphabetical listing of some of the key functions of DX4WIN version 5. The entire list is too extensive to include here.

Awards. Support for DXCC, WAS, WAS and WPX (mixed, mode and band) 5-band DXCC, 5-band WAZ. Separate flags to track the mixed, mode and band awards. Support for custom awards, county, IOTA and VUCC.

Contesting. When contest mode is enabled and a starting time is defined, a new OSO will be checked for a duplicate contact in the contest. An incrementing serial number can be displayed during a contest. Master data files can be used from other contesting software for callsign recognition.

CW keyboard. A full-function CW keyboard which works under Windows. Userprogrammable memories accessed using function keys. Adjustable weighting and visual transmit buffer. Uses interfaces to serial and parallel ports. Buttons available to send stored CW messages using the mouse.

External data. Support for the Buckmaster, Flying Horse (RAC), QRZ!, | Photo A, DX4WIN logo.

Octavia and Amsoft callsign databases on CD-ROM. Support for the GOLIST to obtain OSL manager information. Support for QSL information from a callsign CD-ROM (when provided). Import and Export filter for ADIF filters for: ARRL, CT, DX4WIN, DXBase (3 & 4), DXDesktop, DXLog, EasyLog, GemRadio, HyperLog, LogBook, LogEQF, LogicW, LogMaster, LogPlus, LogWin, N6TR, NA, SD, SecondOP, SwissLog, TopLog, TurboLog, WB2DND, WF1B, WJ2O, WRTC, and others. QSOs that generate errors when imported are still included in the log with an error message attached. It is not necessary to edit an error file and retry the import. Users can define their own import/export filters. Utilities are provided to convert some file formats, such as dBase and comma-delimited, to fixedfield ASCII suitable for the import function.

Gray line. Display shadow and gray line on world map. Calculates gray line data between user's station and DX countries. User defined gray line "window." Calculates sunrise/sunset data for user station and DX station for up to one year.

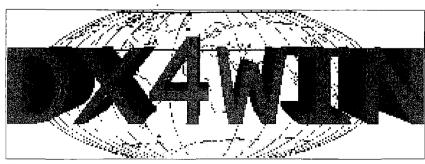
Help. Extensive context-sensitive help with hotlinks to related topics help available by pressing F1 key. User's guide is available from installed file or can be purchased printed and bound to lie flat.

Import/export of logs. Master Call Data: Master Call data can be imported from contesting programs, converted, and used in DX4WIN/32 for contesting or general logging.

Multiple logs. Many users keep separate logs for previously held callsigns, locations or DX peditions in order to be able to make submissions for awards. With DX4WIN you can also logically split the log file, allowing summaries and award calculations to be limited to certain groups of QSOs. Limiting the summaries to a date range allows the user also to monitor "progress" in a contest.

Operating system. 32-bit programming designed to run under all 32-bit versions of Windows. User-friendly install program. The log file is a single file and can be in any directory. Log files are small (500k for 8000 QSOs) and there are no index files, etc., making it easy to back up a log on a floppy disk. Log files can be backed up at a user-specified time interval. Supports serial ports 1 through 8 and parallel ports 1 through 3.

Packet. Large packet window (up to 16,000 lines). Contents of packet window can be copied to the clipboard. Large number of DX spots (up to 16,000 entries). Packet spots are color-coded to reflect



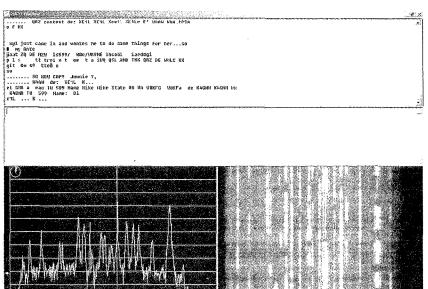


Fig. 1. This is a screen capture from the PSK31 Rumble contest.

Man II & " Box Sheet tray Mit. The Tox Box Sheet May sheet 2705 I'm

status of new country/new mode/new band. Color coding is based on the DXCC, WAZ, or WPX status. DX spots are saved so they

CC CSEZ RepicO Tracker Tracker Select Start Start Tracker Select Start

are available again when the program is restarted. Filtering of spots based on the prefix and/or the CQ zone of the spotter. Avoid

4 Babb ware

getting excited about a spot that was reported on the other side of the world. Voice or CW announcements of DX spots using the Windows sound system. QSX frequencies in spots are recognized in different ways, like QSX 200, WKD 14205, UP 3, DN 4, etc. Additions/deletions and updates of QSOs are reflected in the colors of the spots immediately. New DX spots replace older spots for the same station on the same band; no endless' repetitions of the same spot if you are not connected to the cluster. Support to announce DX, grab DX spot, move radio to the frequency of a DX spot, enter DX spot in the scanner. Tune your radio over the bands and let the

stored packet commands via mouse. TCP/ IP access of worldwide cluster sites using the Internet. (outgoing). OSL management DX4WIN can check your log for outstanding or unanswered QSLs and mark those QSOs again to send follow-up QSL. You can remove multiple QSLs to the same station for the same band and mode. Mark additional QSLs going to the same manager or station for efficient mailing. Change method of routing (buro, direct, etc.) based on

DX spotting window find the spot that is closest in frequency. DX spots can be sorted

by time, arrival sequence, frequency,

callsign of spotter, and priority/callsign; when you sort by priority, all new countries

are grouped together, followed by new mode/band, etc. Buttons available to select

QSL managers. When entering a QSL manager for a station, the information is stored in the QSL manager database. An editor is provided to make changes to the QSL manager database. Over 1,000,000 QSL managers can be stored.

availability of a QSL buro.

RTTY. RTTY terminal window using programmable function keys for sending of "canned" exchanges and information which can contain callsigns, reports, etc. If not being used for RTTY, window may be used for secondary packet connection.

World map. World map window graphically represents bearing and path from user's OTH to DX countries, and is updated by spots as they are received. Show propagation based upon received spots, with user definable parameters. Shows shadow and gray line. Various map projections including great circle projection centered on your QTH. Zoom in on an area, and get coordinates and distance to a location based on the mouse position.

Now, back to the newly integrated PSK31 function. I got a chance to try it out in the October 2000 PSK31 Rumble, and was really impressed. I have been using Zakanaka, and while having the ability to monitor three QSOs at once is a fun feature that is not present in DX4WIN, I found that being able to do the logging without switching programs and manually entering all the database fields is a HUGE plus.

Fig. 1 shows the basic functionality of the PSK31 window in DX4WIN, which contains the following features:

- 1. Waterfall display with zoom function (lower right).
- 2. Spectrum display with frequency markers (lower left).

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3. Dual receive window.

Continued on page 50

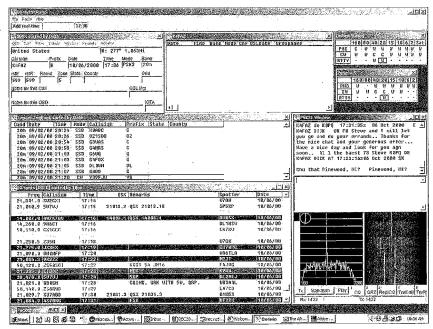


Fig. 2. Here is the main view of DX4WIN.

THE DX FORUM

continued from page 48

- Intelligent text selection in receive window to set fields in QSO window.
- 5. 16 macros that use text form current QSO (bottom button bar).
 - 6. Type ahead for transmit window.
 - 7. 25 seconds playback.

I mentioned that the PSK31 window opcrates within the main logging program. Take a look at Fig. 2. DX4WIN gives you the ability to arrange a number of functional windows on your screen, depending upon the resolution and size of your monitor. Fig. 2 shows the layout of my operating position's screen. In the upper left is the window that is used to enter the data into the log. The mode and band data come directly via CAT from my FT-1000D (I also have an FT-847 in my office connected to a long wire with DX4WIN running on my business PC). I also have windows that display DX spots off the packet cluster (bottom left), a few of the most recent entries in my log, and displays of calls, countries, and zones worked. The PSK31 window is minimized and shaped to fit in the lower right, allowing me to monitor in real time. All I need to do is hit the maximize button on the upper right-hand corner of the PSK31 window, and it is back to full screen as shown in Fig. 1. Neat, huh?

If you are interested in this program, you can drop a line to Rapidan Data Systems, or you can download a demo version from their Web page and try it out for yourself. Here is the contact info: Rapidan Data Systems,

P.O. Box 418, Locust Grove VA 22508; telephone: (540) 785-2669; fax: (540) 786-0658; E-mail: [sales@dx4win.com] or [support@dx4win.com]; Web: [http://www.dx4win.com].

Just listening — an emphasis on the joy of SWLing

I haven't had much time to do much short-wave listening these days, but I did track down some information that I had seen on one of the SWL newsgroups. Just a few days ago I happened upon a discussion on one rec.radio.shortwave newsgroup concerning military operations on 11175 kHz.

Steve Lawrence, in Omaha NE, sent a message to the group that unraveled the mystery of what was being heard on that frequency. In his message he said, "[it is] the United States Air Force Strategic Command Primary Frequency coming from, practically, my backyard here in Omaha (the town of Elkhorn, actually, is where the giant antennas are located). The detail which operates this huge network is based over at Offutt Air Force Base, also a couple of miles from here. They use this frequency to communicate with aircraft ... mostly strategic bombers, but many aircraft can turn up here at any given time."

Tom Sevart N2UHC, in his reply to one of this thread's contributors, provided some additional information concerning some of the operational terms heard on the frequency: "It gets interesting. The 'delta, bravo, victor...' you refer to is probably an Emergency Action Message (EAM) sent out to all listening stations. It is a coded message

which could mean just about anything, including 'launch nuclear missiles.' The Hurricane Hunter aircraft (look for callsign TEAL) use this frequency when chasing hurricanes. I have heard a few interviews from ABC's Nightline program talking to Hurricane Hunter aircraft commanders. This is probably the most listened to utility frequency, and for good reason. Just keep an ear peeled."

Embedded in one of the responses to this thread was a reference to a Web page where information concerning 11175 kHz, as well as numerous other frequencies, may be found. It is the Web page of the Worldwide Utility News Club, aka WUN. Quoting from the WUN Web page, here is a brief description of their organization, and the services they provide.

"With several losses of information available to utility listeners, efforts went into creating a continuing source of utility information, QSLs, and logs. After discussions with many utility fans via E-mail, The WORLDWIDE UTILITY NEWS Club ... or WUN (Like we're #1), was born January of 1995, with its first newsletter sent to members as the February edition. The WUN is the world's first electronic club, and there are no dues or fees from us for joining. You are welcome and encouraged to join in the conversation regarding the "nonbroadcast" or utility stations that may be found in any mode under 30 MHz. WUN also sends a monthly electronic newsletter. To become a member of WUN, you join by simply sending E-mail to the WUN list server at: [majordomo@qth.net], with the following command in the BODY of your E-mail message: subscribe wun.

"The WUN list server is also used for posting hot utility news and general discussion of UTE-related topics. Those subscribed on WUN will receive the newsletter and be able to exchange info, logs, and late-breaking "hot" logs with everyone on the list. The WUN monthly newsletter consists of the following columns: 1. International Civil Aero. 2. Nautical News. 3. Digital Review. 4. Logs Column. 5. The QSL Report. 6. Utility Round-Up. 7. Military Newsreel. 8. Numbers and Oddities. 9. Product Reviews.

"WUN has an Official Club WWW page site: [http://www.wunclub.com]. The WWW pages contain back issues of the WUN Newsletter along with other utility files, links, etc. Any questions, or for more information, please contact Jason Berri, WUN Web Page administrator at webmaster@wunclub.com."

And now the news ...

I just got an E-mail from Bill W7TVF. Here is what he said:

"Hi Fellows.

"W7TVF will be active from Niue Island again from November 19th through December 10th as ZK2VF. Operation will be from 160 meters to 6 meters. Priority will be given to Europe, Africa, and South America on 160 and 80 meters during their grayline. Plenty of time will be spent on all bands for anyone who needs a QSO. An 847 will be used as a beacon on six meters all the time that I am active so if six opens I will be ORT on HF until six mtrs closes. The Six Meter Beacon will be on 50.115. I will be operating from the 'Beautiful Namukulu Motel' with Alpha power and good antennas. The QSL info is the same as last time, which is direct with SASE and return postage to Bill Dawson W7TVF, P.O. Box 4049, Pahrump NV 89061. No donations are needed.

"Again I would like to thank all of you for the extremely courteous operating by almost everyone and that made it a pleasure for me also. The pile-ups were big but easy for me to operate because of your help. I will try to create some even bigger pile-ups this time. Thanks, and CU from Niue Island in November, Bill Dawson W7TVF, ZK2VF."

And I received this from Charly K4VUD on October 4th (I don't know at this moment if he found the extra crew member he needed. Oh, the joy of trying to publish date-sensitive material on twomonth production schedule!):

"As of today, two hams are slated to arrive in A5 on December 1, 2000. The 1kW xmit power is OK'd (with an extra fee!!!). I will likely try to xmit below the American phone band and listen way up into the Am. phone band ... that way, jammers must also violate FCC rules.

"Likely will start out on the usual DX freqs and if a pile-up develops, then announce the QSY freq. Will definitely try the 40 meter SSB split and listen up in Am. phone band. Will use oddnumbered freqs on 40m. Will call on the hour on 160m during likely openings.

"If we can get a third ham on this trip, all three of us will save some money on Bhutan's tourist fees for groups of 3 or more. Come on, just need one more daring adventurer for this trip!

"73, Charly K4VUD, applying for A52UD!!!"

Vox populi

For months, I have been threatening (is that the right word?) to introduce this segment of the DX Forum. The intention all along has been to provide a printed venue for the personal opinions of members of the DX community. The only requirement I have is that folks behave themselves, and be respectful of others.

I received some inputs early on, but none of those folks read the rules, or they just plain didn't care who they offended. But recently, some considerate DXers began sending in comments that were obviously well thought out. In every case they requested anonymity, and as I promised from the beginning that I would respect an individual's right to privacy, I am withholding their identity.

The big-ticket item thus far has to do with the comprehensive changes in the licensing requirements that were enacted on April 15th of this year by the FCC. They primarily have to do with DXers' concerns over the reduction of code speed requirements, and what impact that may have on the pursuit and enjoyment of DX. One DXer from the Phoenix metropolitan area in Arizona wrote, "I am one of those luckless hams who gave in to his XYL and purchased a home in a deed-restrictive community. Consequently, I operate with clandestine antennas, and only at 200 watts to boot. I have had reasonable success in working DX



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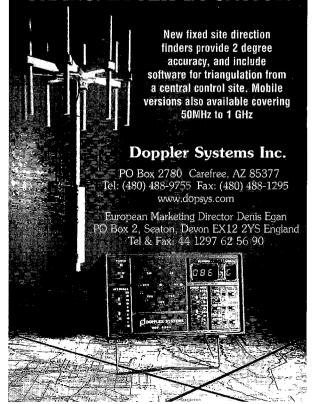
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on CW, but alas I have a rough time punching pile-ups of any size on SSB. My fear is that with the recent changes here in the US, other countries will follow suit, and that DXing will migrate away from CW. Am I going to be left out in the cold with nobody to talk to?"

Another ham up here in the Pacific Northwest caught me at a breakfast gathering and voiced a somewhat related concern. I think he was whining a bit, but his comments are worthy of at least a response from the readership. Here is what he said: "It sure didn't take long for the 'slow-coders' to show up down in the bottom 25 [of 20 meters]. I called CQ the other day and this guy with a new 'cereal box' callsign called me back at something less than 10 wpm. I thought I was

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going to fall asleep just waiting for him to finish calling me. I keep hearing more and more of these ponderously slow operators showing up down there. Why don't they stay in the Novice band where they belong until they can learn to keep up with the rest of us?"

Interesting comments, eh? Let's take the first comment first. I can understand the concern that one might have about losing access to DX stations via what many feel is the most power-efficient, noise-tolerant mode of communication. It is true that some recent DXpeditions were undertaken with the expressed intent of being an SSB-only event. However, having been on the other end of pile-ups at BY1QH and 4Z85TA, I can tell you that my endurance runs much higher on CW than on SSB. If my experience is at all in common with other DXers' on the receiving end of a pile-up, I think we are safe in assuming that CW will always be thought of as a required, if not preferred, mode of communications in their DXpedition planning.

And as for my fellow moss-covered DXer from Seattle, GET A LIFE!! It is clear to me that there is no more effective tool for marginalizing CW in the years to come than the harboring of a parochial attitude toward those who are obviously trying to gain exposure to the CW operator's craft, and are striving to increase their skills. I will confess to you that I, too, find it difficult to carry on a conversation with someone operating below 20 wpm, but darn it, I am very much encouraged by the fact that they are out there. It gives me hope that folks who enjoy "pounding the brass" will still populate post-April 15th ham radio. If anything, we who can rip along at a brisk pace, and carry on an enjoyable high-speed conversation, or run high Q-rates in a contest, owe it to ourselves to mentor and encourage those who have recently-gained access to that portion of the spectrum.

Well, there you have some opinions, and mine as well. What do you think? I hope that this will stimulate some lively discussion on both sides of any given issue. I look forward to hearing from you. Your opinions, regardless of whether or not they are agreeable, are very much appreciated.

Pulling the big switch

So much for this month's offering. I hope the opinions expressed in Vox Populi didn't cause you to take offense. They weren't intended to, at least not by me. Oh, and how could I forget? Have a blessed Hanukkah, and a very merry Christmas this year, so until January ... 73 and good DX!

Mobile, Portable and Emergency Operation

Steve Nowak KE8YN/4 1011 Peacock Ave. NE Palm Bay FL 32907-1371

Who Needs "ER"? HR Responds to a *Real* Emergency!

It always amazes me that no matter how well prepared we believe we are, emergencies are so full of surprises. Of course an emergency is difficult to prepare for since by its very definition it is unexpected. While I pride myself on planning ahead and thinking about many of the possible contingencies, recently I had an experience that reminded me how surprises are the only thing on which you can truly count.

ast Friday afternoon I was sitting in a meeting at the hospital. It being the afternoon and this being Florida, there was a thunderstorm in progress. The rain was coming in sheets and there was significant electrical activity. I noticed that the delay between the lightning flash and the thunderclap was often quite short but at the time that didn't raise any particular concerns. When the lights flickered, everyone noticed since that shouldn't happen in a hospital. Hospitals are required to have power fed from several directions as well as have generators that automatically activate in a power loss. There were several comments around the table as to how unusual it was to see the lights flicker. A few moments later every department director's pager went off at the same time with the text message that the hospital's entire telephone system had been disrupted. Obviously the lightning strikes had been even closer than we had expected. The bottom line was that the entire communications system within the hospital was compromised.

As you might expect, in a hospital, a disruption in communications is a serious problem. A patient who needs an x-ray or to be set up for a blood transfusion or who needs some other assistance usually does not have the option of waiting. Add to this the fact that in this day and age there is a greater emphasis on working efficiently, so most departments do not have people sitting at a desk waiting to answer the telephone. Instead, staff members are expected to be at the bedside performing patient care duties and are able to be contacted by digital pager. There are backup systems, of course, including the

internal telephone system, overhead voice paging, and messages through the hospital computer system. With these redundant backup systems, it is normally quite difficult to disrupt key services. This time, though, all of the regular systems were impacted in some fashion.

Because we always expect the worst, there are additional layers of redundancy, which provide additional protection even in such extreme cases. Some telephones are connected to lines that become direct lines if the central switch is impacted. Several of these are assigned to the main telephone numbers for the hospital for incoming calls. Other direct lines are available as well. Many fax machines are intentionally connected to dedicated lines and are equipped with handsets so that they can provide voice communications in an emergency. Finally key departments such as security and plant operations have two-way radios, and key personnel have cell phones that are certified so as not to interfere with patient monitoring

With all this redundancy, Murphy still showed up early on, and his famous law took effect almost immediately. The lightning strike had not only affected the telephone system, but also the overhead paging system. The digital paging system could not be accessed as readily as normal. The same lightning bolt that had caused the communications problem had also eliminated the air conditioner for the computer room, so the hospitalwide computer system which normally handles patient orders and department-to-department messages had to be taken off line. Finally, hospitals have alarm

buttons which are used to summon the team which responds to a cardiac arrest. Obviously there can be no doubts about the reliability of this system and the ability to dispatch the team that responds.

The hospital immediately implemented its backup plans. Two-way radios were retrieved from their regular users and immediately issued to those people who would be needed in a patient emergency such as a Code Blue. Hospital employees and Hospital Auxiliary volunteers were assigned to act as messengers to carry requests from the nursing units to departments such as laboratory and respiratory therapy. The healthcare professionals on their end began to prioritize their needs and did an outstanding job of restricting communications to critical issues only. The cell phones were used to contact the technical employees who were not already on site and advise them of the need for their presence. Calls were also made to outside services and suppliers needed to begin repair of the main systems.

The direct phone lines worked, but they were in almost constant use for communications with the outside world and did not provide a good mechanism for department-to-department communications. The fax machines quickly became occupied, as the nurses on the patient floors sent faxes to pharmacy, lab, x-ray, etc., with orders for patient needs.

Fortunately, the hospital has had a longstanding relationship with the Indian River Amateur Radio Club in central Brevard County. IRARC has a repeater located on

Continued on page 62

Radio Direction Finding

Joe Moell P.E. KØOV P. O. Box 2508 Fullerton CA 92837 [Homingin@aol.com] [http://www.homingin.com]

T-Hunting by the Bay

For a dozen years, I have told you that southern California is the "center of excellence" in mobile hidden transmitter hunting. To hear them talk, you would think that hams in the shadow of Disneyland and Tinseltown had invented this sport, which is usually called T-hunting or foxhunting. They didn't, but they certainly have led the way in promoting it for a couple of decades.

When it comes to clever hiders, they're hard to beat. I have written of transmitters they have placed in shopping carts, telephone books, fire hydrants and more. It's all in a day's (or night's) fun for them.

But there's no shortage of clever hams elsewhere in the country (and the world). Hams farther north in the Golden State are also making the most of radio direction finding (RDF) adventures.

From San Francisco and Silicon Valley to the great farmlands eastward, hams in the Bay Area converge to test their RDF skills four times a month. On the first Saturday evening, they gather on a hilltop in Fremont to hunt two transmitters. One is intended



Photo A. Paul Shinn prefers his Doppler RDF set, but gets out to take bearings from his truck bed when the signal is weak.

primarily for beginners. There are no mileage or time limits for this "easy" fox. The other one is intended for experienced hunters, who are required to find this "hard" fox first, after which they can look for the other one.

On the first Sunday of the month at 8 a.m., there's a hunt at the Livermore Swap Meet. It's a great way to attract newcomers. Then the Central Valley Hunt takes place on the second Saturday. The third Saturday of the month is a "hider's choice" event. Huntmasters have several sets of rules and boundaries to choose from. One is the Pack-A-Lunch Hunt, which starts at 10 a.m. in Pleasanton and often involves several foxes and creative scoring.

Woven by the Web

The primary scribe for Bay Area T-hunters is Jim Sakane KD6DX. Jim is a lock-smith in Fremont who discovered the joys of RDF about four years ago. His Web site has megabytes of photos, plus play-by-play commentary on past hunts from the point of view of hider or hunter, whichever role he played at the time.

Over the years, I have corresponded by E-mail with KD6DX, plus Mike Allison KN6ZT, Bonnie Crystal KQ6XA, and others who are promoting RDF contesting in that part of California. When I mentioned that a weekend vacation would take me to nearby Stockton, an offer to ride on a hunt was quickly forthcoming.

My host on this balmy September evening was Paul Shinn, a broadcast engineer who participates in hidden transmitter hunts to sharpen the RDF skills he needs for tracking down interference problems related to his work. He has also done lots of experimenting with Doppler antenna switchers.

That weekend's event was a Bay Hunt. Hunters could start anywhere, and the transmitter could be anywhere within ten miles of the shore of the San Francisco Bay, or to the first ridgeline. There was no formal scoring.

On a Bay Hunt, coordination among the hunters on a 440 MHz repeater is encouraged. This isn't a fully cooperative all-hunters-versus-the-hider hunt where everyone shares bearings to see how quickly someone can find the fox. That is done some places as a practice exercise for locating stations in distress.

On this hunt, the cooperation is merely to help everyone get started. Since the boundary is large and hunting teams are dispersed at the start, this is important. This time it was even more so, as hunters determined that the signal was quite weak everywhere. Was the T in a very low spot? Flea-powered? Covered up in some way?

Since I had arrived in Stockton at the last minute, we were late getting started. The first piece of information we needed was the hunt frequency, which we couldn't get until we had driven over Altamont Pass and gotten into coverage area of the 70cm repeater. Then we heard reports from other hunters that the only signals significantly above the noise were coming from East Palo Alto near the Dumbarton Bridge.

Paul decided to take Highway 92 and get to the west side of the Bay as soon as possible. "Since the freeways are lined with huge sound walls on the east side of the bay, I took the San Mateo bridge across the water to the west side," Paul explained. "That let me take Highway 101 southward and not be surrounded by walls."

As we crossed the San Mateo Bridge, we still had no indication on the Doppler, but Paul hopped out as soon as we reached the



Photo B. It can't be in the water, so it must be on the bridge! Assessing the situation are (left to right) Dave McIntyre KG6ACD, Paul Shinn, and Charlie Skiles W6RMR.

west bank and took a beam bearing from his truck bed (Photo A). Sure enough, there was the signal, coming up the bay from the southeast. That was the direction of southbound Highway 101, so off we went.

When we arrived in East Palo Alto, there was still no strong Doppler indication. Paul turned off onto highway 84 and stopped to take another bearing. Now the signal was to the east. According to Paul, "I knew that the farthest east I could go on my bearing line was the Dumbarton Bridge, since any farther took me into the water or back to the east side of the bay."

At that moment, another team drove up. They said they hadn't found it. We looked out at the bay and the bridge, but didn't see any clues (Photo B).

Based on the convergence of bearings, we had to be close, so we headed for the bridge. Just before the toll plaza was a turnout that went down by the water. We took it, drove a short distance, and the signal suddenly became very strong. It's here!

The ammunition-can transmitter was at the top of a ten-foot bridge support column, just under the roadbed (Photo C). Now it was time to examine the equipment of the hunters that who already arrived, and to wait for some more (Photo D).

Early warning

Dopplers are the "weapon of choice" for most mobile T-hunters in the Bay Area. Yagis, quads, and other gain antennas seem to be limited to initial bearings and on-foot use at the end of the road. That's in sharp contrast to southern California, where 4-element yagis and quads are sticking through inch-and-a-half-diameter holes on the roofs of almost every hunting vehicle, swinging back and forth as they go down the road. If a Los Angeles area hunter uses a Doppler on VHF or UHF, it's either in addition to a beam or necessitated by the need for "stealthiness" when tracking jammers and bootleggers.

I'm sure that several kinds of Dopplers are in use in the Bay area, but every one I saw at this event was a MicroFinder by

AHHA! Solutions of Livermore. Rich Harrington KN6FW of AHHA! was one of the hunters, so I took another opportunity to ask him when it would be appropriate for "Homing In" to review this product. KN6FW and KN6ZT developed MicroFinder Version 1 back in 1997. It was so popular that all stock was sold out in a few months. The Version 2 units went even faster. Let's hope that Version 3 will come out soon and there will be plenty on the shelf, so that I can finally bring a review to you.

Another important item of T-hunting equipment, used by Paul and most other Bay Area teams, is a handle-talkie tuned to the

hunt frequency with the antenna removed. Placed on the dashboard, this receiver gives early warning when the signal is strong enough to indicate that "You are here!"

That helped KD6DX and his partner Greg Ottria KE6PTP, who started this hunt from a hill near Eden Hospital in Castro Valley. Greg's bearing indication on the strong signal at the hilltop turned out to be very accurate. When they left the hill, the signal dropped into the noise. It remained unintelligible until they had followed their initial bearing to the east end of the Dumbarton Bridge. Their Doppler got intermittent bearings through the noise, however.

Jim wrote that as Greg drove west on the

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Photo C. Hiders Andy Mascsak WD6CJK (left) and Tony Flusche AB6BR pose with their low-powered transmitter under the Dumbarton Bridge.

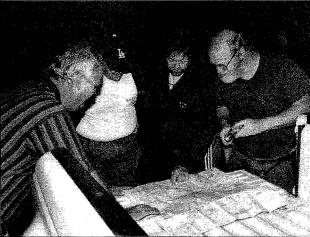


Photo D. After the hunt, participants review their bearings and swap stories. On the right is Rich Harrington KN6FW, hardware designer of the MicroFinder.

Dumbarton Bridge, he commented that they were elevated and the signal was weak, so the transmitter must be very low to the ground and still very far away. "Just as I finished saying it, the signal rose rapidly and then my 'You are here' radio blasted its speaker. I was so busy wondering what was happening that only moments later I looked at the Doppler and it indicated to the rear. Greg found a service road exit a few hundred yards ahead. We took it and followed our Doppler to the transmitter."

Later, over some really good pizza, I learned about many more dastardly Bay Area hiding deeds. One was the Furby Hunt, put on by Bill Dunbar N6IMS and Art

Samuelson W6VV. That's what the signal sounded like at the start point — a Furby toy chatting away more-or-less continuously into what appeared to be a voice-activated transmitter. But was it just one?

N6IMS called the hunters by radio to tell them that the special rules of this hunt demanded that each team independently determine how many transmitters there were and then find them all with least elapsed mileage to win.

Jim Sakane's Web narrative tells how he used the multipath quality indicator on his Doppler set to deduce that there were two transmitters chatting in a Furbish "dialogue." I suspect that others did something similar, unless they had an RDF antenna hooked to a receiver with S-meter and could ascertain some difference in signal strength or direction of the two Furby foxes. Careful viewing of the Doppler led Jim to conclude that the bearing for one was 70 degrees and the other was 95 degrees.

As it turned out, the targets were four miles apart in separate new-construction areas, one just north of Interstate 580 and the other in Pleasanton. How did two Furbys hold a QSO? Jim explains: "N6IMS removed the brains from both Furbys and carefully placed them into an electrically nurturing controller box at Site 2. Domo's voice was connected directly to the Site 2 transmitter. Lulu's voice went to a UHF link transmitter that communicated with the body of Lulu at Site 1."

Since both brains were in one controller box, they were able to play and talk to each other. Furbys put themselves to sleep after a short time, so Bill added circuitry to provide pseudo-separation and reintroduction every 30 seconds.

There seems to be a sort of informal contest in the bay Area to see who can make the smallest effective fox transmitters. They have miniaturized the Montreal Fox Controller with surface-mount components to near postage stamp size. (See "Homing In" in the April 1998 issue for a full description of that project.) The winner for smallest fox at the pizza parlor that night was Henry Schroeder KF6PCE, whose transmitter, antenna, battery, and controller fit into a 35mm film canister.

If you don't want to drive a long way to the starting point, have the starting point close to you. That's what Paul Shinn did, beginning last May. The post-hunt barbecue that he promised was enough incentive to bring five vehicles to Stockton for the first one. That hunt featured two transmitters 10 kHz apart, one supposed to be easy and the other hard. The hard one turned out to be extra difficult because an antenna connection failed. Only one team heard it and found it. Paul has just begun a Web site to promote these Central Valley hunts.

Jim's and Paul's Web sites have many more tales and photos of Bay Area T-hunts, plus information on how you can join the fun when you're in the area. Complete rules, maps, and upcoming hunt schedules are there. You can jump to these sites by link from my "Homing In" site.

Give a hoot

Is your listening "for the birds"? We certainly hope so. This is the third year that "Homing In" readers are helping Canadian researchers find out what happens to juvenile burrowing owls that hatch in Saskatchewan and Alberta during summer

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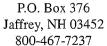






Photo E. To see burrowing owls during the day, look down, not up.

months (**Photo E**). These birds, which are classed as "endangered" in Canada and "threatened" elsewhere, head south in late September and October to parts unknown, possibly southern Texas and northern Mexico.

Unlike other Strigiformes, it's unusual to see a burrowing owl in a tree. They prefer to take over abandoned badger or ground squirrel burrows in grasslands (**Photo F**). They can also be found near urban areas, using artificial burrows such as pipes, culverts, and piles of rock or concrete. They usually stand near the entrance of their home during the day and fly a short distance away if approached. At night, they go airborne for long periods, looking for food.

About 200 Canadian-hatched owls were banded last summer, and 70 of those were fitted with miniature VHF transmitters. In previous years, attempts to follow the birds southward with small aircraft have been unsuccessful, due to weather conditions that kept the planes from flying, but not the birds.

That's where you come in. Hams and scanner listeners are needed to carefully tune from 172 to 173 MHz for these radio tags. Monitors in Texas (particularly the Corpus Christi area) are especially needed, but these birds might spend the winter anywhere from southern California to Mississippi. Last winter, three hams (KC1QF, K5BL, and K5DXM) reported hearing signals. Farthest west was Tucson, Arizona, and easternmost was Fort Smith, Arkansas. The banded birds were not actually sighted, so it's possible that these signals were not actual owl tags. That's why even more monitoring hams are needed this year, preferably with RDF capability.

Continued on page 62



Photo F. Researchers want to know why the burrowing owl population is decreasing. This one is using an infrared "peeper" camera on the end of a flexible shaft to look at hatchlings deep in a burrow. Her head is covered so that she can see the video monitor on her goggles.



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The POWER STATION 2 provides 12V from two cigarette lighter outlets and has two recessed terminals for hardwiring. A set of metric wing nuts for use with the two terminals and jumper cables for charging small gel cells are also included. The POWER STATION 2 can be charged in an automobile in only 3 hours, or in the home in 8 hours. The charger will automatically shut off when the battery is completely charged. In addition, The POWER STATION 2 may be charged with a solar panel (sold separately). Via The POWER STATION 2 AC input, a 5 watt or smaller panel may be used. In this case only, no charge controller is needed. Or any size panel with a charge controller may be utilized with the two recessed terminals. Therefore, The POWER STATION 2 may be charged even when it has only been slightly discharged (unlike Ni-Cads that have memory). The charging circuit uses voltage sensing circuitry. Other brands are timed chargers, which always charge a battery a full cycle. If all that is needed is a partial charge, this damages a battery and shortens the life. The POWER STATION 2 has a voltmeter that indicates the state of charge of the battery, not worthless idot lights that declare YOUR BATTERY IS NOW DEAD. The voltmeter can even be used to measure voltages of other sources.

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Michael Bryce WB8VGE SunLight Energy Systems 955 Manchester Ave. SW North Lawrence OH 44666 [prosolar@sssnet.com]

Loose Ends

This month, I plan to tie up some loose ends. We'll start with the small QRP bench power supply that was first shown last time. In the photos, you'll see my version. I've been working on this project for a week or so. There are some loose ends that need to be addressed on my version as well.

As you can see, I've managed to put the entire project into a very small box. I used 1/4-inch aluminum angle to hold the PC boards upright. The transformer fits into the space between the power supply PC board and the second PC board.

Metering circuit

That second PC board is a DPM panel meter driver. I used a surplus digital panel meter for adjusting the output of the supply. These digital panel meters run from a nine-volt source. The surplus digital meter requires its own power supply. They cannot read their own supply voltage. The DPM panel meter driver provides the required isolated voltage at about 5 mA. More than enough for this surplus meter. I got my DPM from one of the surplus supplies at this year's Dayton Hamvention. You can pick up digital panel meters from just about any surplus parts dealer.

An ordinary analog panel meter would have worked just as well. The downside in using an analog meter was trying to find one that would fit the cabinet I was building the

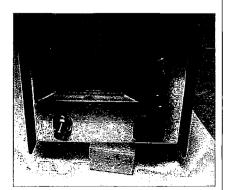


Photo A. The QRP bench power supply. A knob, LED, and labels will finish up the project.

supply in. Also, the price of a good analog meter would have been many times that what I paid for the surplus digital meter.

I decided to go with more power than the LM317T regulator could supply. I ended up using the LM317K regulator. This regulator requires a large heat sink. In the photos, you can see the heat sink mounted on the regulator. By placing the regulator on the top side of the board, the heat produced will not affect the operation of the supply. The power supply PC board will handle either the TO-220-style 1 A regulator or the TO-3-style regulator.

Because I will be using the supply for the workbench, I also added a ten-turn front-mounted pot. All I had in the junk box were 10k units, so to get the ten-turn pot to function, I placed a 1.8k resistor across its terminals. This gives me a range of from about eight volts to a tad over 14.9 volts. The combination of ten-turn pot and fixed resistor are in place of the 5k PC board-mounted trimmer. Wires are run from the trimmer location to the ten-turn pot.

Five-way binding posts round out the supply. Also in the works, I have been thinking of placing a small 12-volt DC fan on

the rear of the supply. The fan would help cool the regulator during high current operation. Right now, this is only a thought, but since there is room on the back apron, why not?

Wiring the supply

The way the PC board has been de-

signed, all interconnections are done with AMP MTA cables and connectors. Of course, you can hardwire all the required wires to the PC board and bypass the fancy connectors. But after you have built several projects using MTA connectors, you'll never go back to hardwiring anything again. Since I did not get my supply wired in time, the photos show only several of the many wires connected. Also, to protect the supply, a fuse holder has yet to be installed on the rear apron. Since space is a bit limited inside the case, I chose a fuse holder that used 5- x 20-mm fuses. This leaves me enough room to wire the primary side of the supply inside the confined space.

Buttoh things up

By the time you read this, the QRP bench supply will be all finished and in use. As a matter of fact, during testing I used the supply to operate a small QRP rig. It performed perfectly. I also use the supply to recharge batteries and even run the filaments on a tube base QRP rig!

I hope you plan on building your own QRP bench supply. Remember that this is a project that just begs for you to tinker with

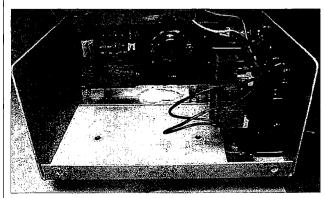


Photo B. Inside the QRP bench supply. The transformer is not shown.

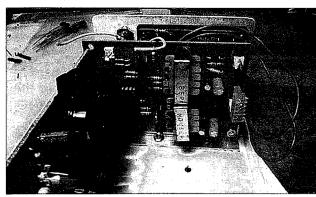


Photo C. Here is a view of the panel meter supply. The QRP bench PC board is mounted on edge.

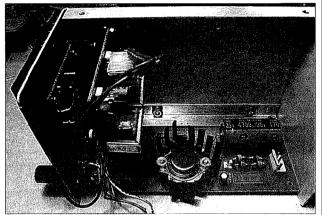


Photo D. Here's a view of the QRP bench supply, showing the large heat sink that holds the regulator IC.

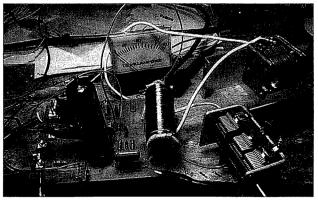


Photo E. Oh, my! Tubes? Yes, sitting someplace on 40 meters, this guy does about five watts output. It's got more bugs than a rain forest, but it does work!

it. There's nothing cut into stone, and the circuit can easily be adapted to suit many needs. Also, the circuit is very forgiving, so you can make drastic changes in component values and the thing will still work!

You can get the PC board from FAR Circuits, 18N640 Field Ct., Dundee IL 60118-9269. It's \$4.50 plus \$1.50 shipping for up

to three boards. Be sure you ask for the QRP bench power supply.

The Barney project

Barney KB8SKL and I work at the same steel mill. It's not unusual for us to spend an hour or so talking about ham radio at work. Barney is always building something, but usually moves on to another project before the last one he started gets finished.

Since Barney is from the old school, vou can ask him what a 6EA8 is used in and he'll tell you it's an IF amplifier used in TVs. He'll also tell you the pinout and the make and model of the TV chassis that uses them! I can spout off the pinouts of most ICs, but have to dig out the old handbook when it comes to tubes.

Now, having said all of that, Barney and I have been talking about putting a tube or two to work as a QRP transmitter. Barney talked me into using a 6GW8. "A power house of a tube" says Barney.

Yup! That's what it's called. The Barney project started out as a QRP transmitter that is based

on a single audio tube. Designed for 80 and 40 meters, the transmitter will produce about five watts. You only get a peak at the first design stage. I've laid out a PC board and I am in the middle of debugging the circuit. Looks like an interesting project.

Next time, I dive into the Heathkit HW-9. After selling the one that I assembled, I

finally picked up another set. We will do some modifications, look over some Heathkit factory fixes, and align the radio, too. Should be a lot of fun, so stay tuned!

Best holiday wishes to one and all!

ORX

continued from page 8

electronic devices — including your 2-meter HT and all other ham radio gear — remains in place.

FYI, the aviation industry now differentiates between intentional and unintentional transmitting devices. Devices such as cellular telephones, hand-held two-way radios, two or more inter-connected electronic games, or hand-held computers that receive E-mail are considered to be intentional RF emitters and are totally banned at all times. Scanner radios and ham radio transceivers fall into this category. On the other hand, most airlines permit unintentional RF emitters such as laptop computers or CD players to be used after a plane crosses through 10,000 feet.

Thanks to David Black KB4KCH and Newsline, Bill Pasternak WA6ITF, editor.

NEVER SRY DIE

continued from page 6

Wylder, Sewall, Stearn, Hoyle, Jueneman, and so on, that I've reviewed in my Secret Guide to Wisdom book. After you've done some of my suggested reading, you may start wondering how the spiritual establishment has been able to ignore so many important developments in their field of supposed expertise. Or, you may not.

My-role in life has developed into my being an iconoclast — a breaker of icons, challenging conventional or cherished beliefs and institutions as being false. And, since there seems to be no shortage of false conventional beliefs, I'm having a wonderful time letting the hot air out of the establishment panjandrums with my secret guides to health, wealth, and wisdom.

Drugged!

I'm enjoying all the political nonsense about the high cost of prescription drugs for the impoverished elderly. Will the micro-movement I'm starting to get people to stop poisoning themselves, and thus have no need to further enrich the pharmaceutical giants, pick up enough momentum to make today's prescription drugs as popular as bloodletting to cure dropsy?

If we can get people to stop abusing

Continued on page 60

CALENDAR EVENTS

Listings are free of charge as space permits. Please send us your Calendar Event two months in advance of the issue you want it to appear in. For example, if you want it to appear in the February 2001 issue, we should receive it by December 31. Provide a clear, concise summary of the essential details about your Calendar Event.

JAN 20

ST. JOSEPH, MO The Missouri Valley ARC and Ray-Clay ARC will sponsor their 10th annual Northwest Missouri Winter Hamfest, 8 a.m.-3 p.m., January 20th, 2001. The event will take place at the Ramada Inn, I-29 and Frederick Ave. (exit 47 on 1-29), in St. Joseph MO. Special room rates are available for Hamfest participants. Talk-in on 146.85 and 444.925. VE exams, major exhibitors, and flea market all indoors. Free parking, Admission is \$2 each, or 3 for \$5 in advance; \$3 each, or 2 for \$5 at the door. Pre-registration requests received after Jan. 5th will be held at the door. Swap tables are \$10 each for the first two tables. Commercial exhibitors welcome, write for details: Northwest Missouri Winter Hamfest. c/o Neal or Carlene Makawski WBØHNO/ KAØIKS, 3704 Meadowoak Lane, St. Joseph MO 64503. Tel. (816) 279-3406; E-mail [nem3238@ccp.com].

JAN 21

HAZEL PARK, MI Hazel Park ARC's 35th Annual Swap & Shop will be held at the Hazel Park High School, 23400 Hughes St., Hazel Park MI. Open to the public 8 a.m.–2 p.m. Plenty of free parking. General admission is \$5 in advance or at the door. Tables \$14; reservations for tables must be received with check. No reservations by phone. Talk-in on 146.64(-), the DART repeater. For more info about the swap, tickets or table reservations, mail to HPARC, P.O. Box 368, Hazel Park MI 48030.

SPECIAL EVENTS, ETC.

DEC 8-9

BETHLEHEM, IN The Clark County ARC will operate W9WWI, 1500Z Dec. 8th–2200Z Dec. 9th, in celebration of the Christmas season. Operation will be on General 75, 40, and 20 meters. QSL with an SASE for a certificate to *CCARC*, 1805 E. 8th St., Jeffersonville IN 47130.

DEC 18-JAN 2

CINNAMINSON, NJ Join the Amateur Radio Lighthouse Society in their "Lighthouse Christmas Lights" special event, to promote public awareness of ham radio and lighthouses; to contribute to the recognition that lighthouses, lightships, and their keepers deserve: to foster camaraderie within the ham fraternity; and to provide fellowship amongst the members of the Amateur Radio Lighthouse Society. This is not a contest and you do not have to operate from a lighthouse in order to participate, Time: 0001 UTC Dec. 18th-2359 UTC Jan. 2nd. Modes: Any and all! SSB, FM, PSK, SSTV, even light beams and semaphores. Repeater operation is also allowed. Bands: Any authorized bands including WARC. Suggested frequencies (±20 kHz): 1.970, 3.970, 7270, 14.270, 21.370, 28,370. Procedure: Call CQ Lighthouse or CQ/ LH. Exchange: ARLS members give out cali sign, ARLS membership number (see your newsletter mailing label for yours if you don't know it), your name, and state or province. Nonmembers give call sign, name and state or province, Awards: Certificate for working 10 or more lighthouses/ships or 5 or more member ARLS stations. Send log info to ARLS, P.O. Box 2178, Cinnaminson NJ 08077 USA. Include SASE 9- x 12-inch envelope and \$1 for return of certificate. Send questions via E-mail to Jim K2JXW at [weidner@waterw.com].

NEUER SRY DIE

continued from page 59

their bodies, they'll stop going to their doctors and getting prescriptions for drugs to help them not feel the warning signals their bodies are sending as their lifestyle breaks down one part of their body after the other.

One more thing. Every one of these drugs has side effects, and none of them is beneficial.

As a result of my guest appearances on the *Coast-To-Coast* show, listened to largely by insomniac seniors, all paying hefty prescription drug bills, where I've preached my stop-poisoning-yourself sermon, I've been getting endless letters, Emails, and phone calls from people thanking me for changing their lives. They're drug-free at last and feeling better than they have in years.

My message to them: Please spread the word.

SETI

The Search for Extraterrestrial Intelligence, from my viewpoint, is a huge waste of time and money. But then, scientists are well known for their single-minded pursuit of their own special interests, while ignoring the work of others which might disturb their beliefs.

In the case of ETs, there are lots of relevant-published materials which confirm beyond any reasonable doubt that ETs are here and have been for a very long time.

Further, they're eons ahead of us in technology. They communicate by telepathy. They are able to travel through time—which helps explain how they can come here from zillions of miles away.

UFO research expert Stanton Friedman, on the *Coast-To-Coast* show, called SETI a Silly Effort To Investigate. I like that.

With millions of UFO sightings in countries all around the world, one has to be truly ignorant to reject the UFO reality.

But then, there's sure a lot of ignorance going around. And some of these contraptions are bigger than a football field, and they've been seen up close.

So why is the government keeping so silent on the subject? Why are they ignoring all Freedom of Information requests for government data? It doesn't take a genius to figure that one out.



Jim Gray II P.O. Box 22799 Juneau AK 99802

Erratic (with Possible Sleigh Static)

The best description of propagation conditions for December is erratic. Sunspot numbers will continue to remain very high, and a fair amount of associated solar activity will continue to plague the HF operator, although I don't foresee any highly disruptive events.

The poorest conditions are predicted for Christmas, from the 24th–26th, while a lesser disturbance may be expected from the 16th–19th. Look for the first and last days of the month to be your best bets, with other fairly good periods occurring on the 7th–9th and 21st–23rd. The rest of the month will be tedious at best, but patient listeners may occasionally find a surprising opening as conditions fluctuate.

One of my dad's favorite tricks was to park his receiver on a seemingly unused frequency and wait for something to pop up while he caught up on his reading or correspondence. He was often able to snag a rare contact before the station became saturated with calls. Southern Asia and the Indian Ocean were among his favorite hunting grounds, especially when the aurora wasn't too active. For daily auroral activity, look at the NOAA POES satellite Web site at [http://www.sec.noaa.gov/pmap/index].

Band-by-Band Summary

10/12 meters

Good worldwide openings can be found from sunrise to just after sunset. Europe, the Middle East, and Africa are typically open until about noon. Central and South America should be open from midmorning to late afternoon, but expect some noontime fading. Look for afternoon to early evening opportunities into the Pacific, Australia, and the Far East. A short-skip of 1,000–2,000 miles will be typical.

15/17 meters

Openings to most areas of the world can be found from sunrise

December	2000
----------	------

SUN	MON	TÜE	WED	THU	FRI	SAT
					1 G	2 G
3 G	4 F	5 F	6 F	7 F-G	8 F-G	9 G
10 F-P	11 F	12 F	13 F-P	14 F	15 F-G	16 F-P
17 F-P	18 P	19 P	20 F	21 F-G	22 G	23 G
24 F-P	25 P	26 F-P	27 F	28 F-G	29 G	30 G
31 G						

to early evening. Europe, North Africa, and the Middle East typically peak around mid-morning with South Africa coming in just a bit later. Early afternoon is best for Central and South America, but they can be worked from late morning to early evening. The

Continued on page 62

			E	EASTE	RN UN	IITED S	STATE	S TO:				
GME	100	02	04	06	08:	100	7 12 1		1196		(.20)-	22
Central America	15 (40)	20 (40)	20 (40)	(40)	(40)	(20-40)	(15) 20	10-20	10 (20)	10-17	10 (20)	(10) 20
South America	(15) 20	20 (40)	20 (40)	20 (40)	x	×	(15-20)	X	(10)	10 (15)	10 (20)	(10) 20
Western Europe	40	40	40	40	(40)	×	(10-20)	10 (20)	(10) 20	(15-20)	(20)	(20-40)
Southern Africa	(20-40)	(40)	x	×	×.	×	х.	(10-12)	10 (17)	(12) 17	(15-20)	20
Eastern Europe	(40)	(40)	ж.	×	(20)	×	(10-20)	(10) 20	(20)	:rxx	×	х
Middle East	(40)	(40)	×	×	×	×	(10)	(10-15)	15 (20)	20	(20)	(20)
india/ Pakistan	x	×	×	×	x	×	×	(15-20)	х	×	×	(20)
Far East/ Japan	(15) 20	20	(20)	(20)	x	×	(20)	х	×	×	×	(10-20)
Southeast Asia	(15-20)	×	×	×	χ×	<u>-</u> ×	×	(10-20)	(10-15)	×	×	×
Australia	(10-17)	(15-20)	×	X_	(20)	(30-40)	(20-40)	(10) 20	(10-20)	×	(20)	(10-15)
Alaska	15-17	20-30	×	×	х	20-30	20-30	15-17	15-17	×	х	15-17
Hawaii	(10) 15	(20)	20	(20)	20 (40)	40	(20-40)	(20)	(15-20)	×	(10)	10 (15)
Western	(10) 40	(15) 40	20-40	(20) 40	40	40	40	(20-40)	(10-20)	10-20_	10-20	10-20

CENTRAL UNITED STATES TO:

America	(15) 20	20 (40)	(20) 40	(20) 40	(20) 40	40	(40)	(10) 20	10-20	10-15	10 (20)	15-20
South America	(15) 20	20	20 (40)	20 (40)	(20)	x	×	x	(10)	10	10 (20)	(10) 20
Western Europe	(40)	40	40	(40)	×	x	(20)	(15) 20	(10) 15	(15) 20	(20)	×
Southern Africa	20	(20)	x	×	×	×	×	×	(10-15)	(10) 15	15 (20)	20
Eastern Europe	×	(40)	x	×	×	×	×	(10) 20	(10-20)	×	x	x
Middle East	x	(40)	(20)	(20)	×	x	х •-	(10-15)	(10-15)	(20)	20	(20)
Indra/ Pakistan	×	(15)	×	×	×	×	(20)	×	(15)	×	×	x
Far East/ Japan	x	×	(20)	20	(20-40)	(40)	(20)	20	(15-20)	×	15	(15)
Southeast Asia	x	×	×	x	(20)	(20)	20	(15-20)	(15)	×	(15)	×
Australia	(10) 15	15	(15-20)	20	20 (40)	20-40	20 (40)	(20)	x	×	×	(10-15)
Alaska	15-17	15-17	- ×	×	×	(40)	(40)	20	20	×	×	×
Hawaii	(10) 15	(15-20)	20	20	(40)	(20-40)	20 (40)	×	(15)	(15)	(15)	(10) 15

WESTERN UNITED STATES TO:

America	(20-40)	40	40	40	(40)	l ×	(20)	(10) 20	10 (20)	10 (20)	(10) 20	(15) 20
South America	17 (40)	(20)	x	×	×	×	×	(15)	12 (20)	10-20	10-20	12 (40)
Western Europe	×	ĸ	(40)	(20)	(20)	×	(20)	(10-20)	(10) 20	(20)	×	×
Southern Africa	(20)	x	x	×	×	×	х	×	(10)	(15)	15 (20)	(15) 20
Eastern Europe	×	х	×	х	×	x	X.	×	×	×	×	×
Middle East	(20)	(40)	(20)	20	20	(20)	x	(15)	(10) 15	(10-15)	(20)	(20)
India/ Pakistan	(15-20)	х	Ŕ	х	×	×	x	(20)	×	×	×	×
Far East/ Japan	(10) 20	(15-20)	х	×	(40)	40	(40)	×	×	×	(10-20)	10-20
Southeast Asia	(15)	(20)	,x	×	×	х	x	(20)	(15) 20	(20)	(10-15)	10-15
Australia	(10-15)	(15-20)	х	×	×	(20-40)	(20-40)	20	(15-20)	15	(10-15)	10
Alaska	10-15	×	X.	20-30	20-30	20-30	20-40	Х.	20	15	×	15-17
Hawaii	(15) 20	(15) 20	20	(20)	(40)	40	(20-40)	(15) 20	15 (20)	(10-15)	10 (15)	(10) 15
Eastern USA	(10) 40	(15) 40	20-40	(20) 40	40	40	(20-40)	(10-20)	10,20	10-20	10-20	10:20

PROPRGATION

continued from page 61

Pacific and Asia are typically best in the late afternoon or early evening. Short-skip distances average about 1,000 miles.

20 meters

Worldwide DX is workable just about around the clock—even low power stations can find strength here. Peaks typically occur for a few hours after sunrise, from late afternoon into early evening, and again just before midnight. Try Europe and Africa in late afternoon, Central and South America in the evening, and westward into the Pacific from before midnight until sunrise. Expect a 500–1,000 mile short-skip during the day and 1,500–2,000 miles at night.

34/40 meters

Daytime openings should not be overlooked, but these bands are definitely best after dark. Europe and other areas to the east can be worked in the early evening while Central and South America are pretty much always open throughout the hours of darkness. The Pacific and Far East begin building around midnight and peak before sunrise. 1,000–2,000 mile short-skip is typical after dark while 1,000 miles is typical during the day.

80/160 meters

Worldwide DX may be observed from local sunset until local sunrise. Europe, Africa, and the Middle East start to build after sunset and peak before midnight. Other parts of the world can be worked from midnight until sunrise. Atmospheric noise on these bands should steadily decrease throughout December since most tropical storm activity will have subsided in most regions of the world except between Australia and French Polynesia. Activity on 40 meters is a clue that these bands might be open. Short-skip is usually from 1,500–2,000 miles. Happy Holidays!

Angel Voices

continued from page 36

implement. There wasn't any way possible for me to have cut the rope as I stood near the top of the tower. And we had both checked the rope before I had climbed up on the tower.

"Tell me again what the voice told you, Bill," Jerry said.

Very carefully, I explained how each time the voice had called out to me from a few feet away and up in the sky.

"That's it," Jerry said. "We're through for the day. Don't bother to go back up there, leave it. We'll do this another time. Here, hold the rope so I can wrap a few turns of electrical tape around it so it won't pull apart."

The ends of the rope were still flush with each other, except for the little strand of hemp. Both ends of the rope were clean, not ragged.

Both of us started asking questions back and forth. "It's just amazing," I said

"Who was the voice you heard up above you, Bill? And what could have possibly cut this rope so cleanly?" Jerry asked.

He stood there and looked at me, and I looked at him.

Jerry said, "Let's put all this gear away and then go to your house — I want to show this to your folks." And that's what we did. When my parents saw the rope and heard our story, they too were amazed.

Jerry finally finished tuning his beam with the help of another ham friend, who had a climber's belt. Looking back now over all those years gone by, I am still in wonder about the events that happened that day, because in the ensuing years they have happened again several times, though not in connection with amateur radio.

ON THE GO

continued from page 53

the hospital's roof and has several operators assigned to report immediately to the hospital if the county activates any number of its disaster plans. Jim Bayless W4BAL was at the county Emergency Operations Center when I put out the call, and immediately got the ball rolling. Soon we had one operator in the Emergency Department (Vern KØEGA); Jim in the lab; and Bob W4PRK covering cardiopulmonary, which includes respiratory therapy and EKG. When Roy W6QCM got in, he immediately set up in radiology and contacted his wife Gail KG4HZW. Gail began contacting other hams to ensure that if necessary, coverage would be scheduled for the next 24 hours.

Working with the Senior Vice President of Nursing, we determined the most critical areas to cover and ended up with Al N4TME assigned to the Intensive Care Unit, Gail covering the Cardiac Surgical Unit, and Norm W1TLZ covering the third floor nursing station. When an emergency surgical case was begun, Roy was reassigned to the surgery office. Although the phone system was beginning to work again, in order to provide that extra layer of reliability it was decided that a ham was good (and cheap) insurance. After all, during repair operations we all know stressed components can fail. or it may become necessary to remove and replace circuit boards or modules which will take the circuit off line. The hams provided the assurance that until everything was proven to be fully reliable, no patient would be at risk.

The bottom line was that the hospital had planned effectively for such an emergency, and the Indian River Amateur Radio Club's role was included in their plan. The communications emergency was handled so that no serious disruptions occurred and most of the situation was transparent to the patients in the hospital. While several elements of the plan did not work out exactly as anticipated, the multiple levels of redundancy worked out. Ham radio once again "rogered up" and made a big difference.

HOMING IN

continued from page 57

My Web site has details of the Burrowing Owl Project, including all of the frequencies, equipment suggestions for monitoring and RDF, plus what to do if you hear a possible tag signal. If you're not on the Web, send me a self-addressed stamped envelope and I'll reply with a hard copy. To rapidly spread the word whenever signals are heard, I have just started the "biotrackers" Internet mailing list (also called a discussion group or reflector). To subscribe, send E-mail to [biotrackerssubscribe@egroups.com] with "subscribe" in subject and body.

By the way, burrowing owls don't actually hoot. As they fly at night, they emit loud cries. If you disturb one in its burrow, it may try to scare you away by mimicking a rattlesnake.

Say You Saw it In 73!

Wise Up!

Here are some of my books which can change your life (if you'll let 'em). If the idea of being healthy, wealthy and wise interests you, start reading. Yes, you can be all that, but only when you know the secrets which I've spent a lifetime uncovering.

.....Wayne

The Bioelectrifier Handbook: This explains how to build or buy (\$155) a little electrical gadget that can help clean the blood of any virus, microbe, parasite, fungus or yeast. The process was discovered by scientists at the Albert Einstein College of Medicine, quickly patented, and hushed up. It's curing AIDS, hepatitis C, and a bunch of other serious illnesses. The circuit can be built for under \$20 from the instructions in the book. \$10 (#01)

The Secret Guide to Wisdom: This is a review of around a hundred books that will help you change your life. No, I don't sell these books. They're on a wide range of subjects and will help to make you a very interesting person. Wait'll you see some of the gems you've missed reading. \$5 (#02)

The Secret Guide to Wealth: Just as with health, you'll find that you have been brainwashed by "the system" into a pattern of life that will keep you from ever making much money and having the freedom to travel and do what you want. I explain how anyone can get a dream job with no college, no résumé, and even without any experience. I explain how you can get someone to happily pay you to learn what you need to know to start your own business. \$5 (#03)

The Secret Guide to Health: Yes, there really is a secret to regaining your health and adding 30 to 60 years of healthy living to your life. The answer is simple, but it means making some difficult lifestyle changes. Will you be skiing the slopes of Aspen with me when you're 90 or doddering around a nursing home? Or pushing up daisies? No, I'm not selling any health products. \$5 (#04)

My WWII Submarine Adventures: Yes, I spent from 1943-1945 on a submarine, right in the middle of the war with Japan. We almost got sunk several times, and twice I was in the right place at the right time to save the boat. What's it really like to be depth charged? And what's the daily life charged a submarine like? How about the Amelia Earhart inside story?If you're near Mobile, please visit the Drum. \$5 (#10)

Wayne's Caribbean Adventures: My super budget travel stories – where I

visit the hams and scuba dive most of the islands of the Caribbean. You'll love the special Liat fare which let me visit 11 countries in 21 days, diving all but one of the islands, Guadeloupe, where the hams kept me too busy with parties. \$5 (#12)

Cold Fusion Overview: This is both a brief history of cold fusion, which I predict will be one of the largest industries in the world in the 21st century, plus a simple explanation of how and why it works. This new field is going to generate a whole new bunch of billionaires, just as the personal computer industry did. S5 (#20)

Cold Fusion Journal: They laughed when I predicted the PC industry growth in 1975. PCs are now the third largest industry in the world. The cold fusion ground floor is still wide open, but then that might mean giving up watching ball games. Sample: \$10 (#22). Julian Schwinger: A Nobel laureate's talk about cold fusion—confirming its validity. \$2 (#24)

Improving State Government: Here are 24 ways that state governments can cut expenses enormously, while providing far better service. I explain how any government bureau or department can be gotten to cut it's expenses by at least 50% in three years and do it cooperatively and enthusiastically. I explain how, by applying a new technology, the state can make it possible to provide all needed services without having to levy any taxes at all! Read the book, run for your legislature, and let's get busy making this country work like its founders wanted it to. Don't leave this for "someone else" to do. \$5

Mankind's Extinction Predictions: If any one of the experts who have written books predicting a soon-to-come catastrophe which will virtually wipe most of us out are right, we're in trouble. In this book I explain about the various disaster scenarios, like Nostradamus, who says the poles will soon shift (as they have several times in the past), wiping out 97% of mankind. Okay, so he's made a long suing of past lucky guesses. The worst part of these predictions is the accuracy record of some of the experts. Will it be a pole shift, a new ice age, a massive solar flare, a comet or asteroid, a bioterrorist attack? I'm getting ready, how about you? \$5 (#31)

Moondoggle: After reading René's book, NASA Mooned America, I read everything I could find on our Moon landings. I watched the videos, looked carefully at the photos, read the astronaut's biographies. and talked with some of my readers who worked for NASA. This book cites 25 good reasons I believe the whole Apollo program had to have been faked. \$5 (#32)

Classical Music Guide: A list of 100 CDs which will provide you with an outstanding collection of the finest classical music ever written. This is

what you need to help you reduce stress. Classical music also raises youngster's IQs, helps plants grow faster, and will make you healthier. Just wait'll you hear some of Gotschalk's fabulous music! \$5 (#33)

The Radar Coverup: Is police radar dangerous? Ross Adey K6UI, a world authority, confirms the dangers of radio and magnetic fields. \$3 (#34)

Three Gatto Talks: A prize-winning teacher explains what's wrong with American schools and why our kids are not being educated. Why are Swedish youngsters, who start school at 7 years of age, leaving our kids in the dust? Our kids are intentionally being dumbed down by our school system—the least effective and most expensive in the world. \$5 (#35)

Aspartame: a.k.a. NutraSweet, the stuff in diet drinks, etc., can cause all kinds of serious health problems. Multiple sclerosis, for one. Read all about it, two pamphlets for a buck. (#38)

One Hour CW: Using this sneaky booklet even you can learn the Morse Code in one hour and pass that dumb 5wpm HF entry test. \$5 (#40)

Code Tape (T5): This tape will teach you the letters, numbers and punctuation you need to know if you are going on to learn the code at 13 or 20 wpm. \$5 (#41) Code Tape (T13): Once you know the code for the letters (#41) you can go immediately to copying 13 wpm (using my system). This should only take a couple of days. \$5 (#42)

Code Tape (T20): Or, you can start right out at 20 wpm and master it in a weekend. \$5 (#43)

Wayne Un-Dayton Talk: This is a 90-minute tape of the talk I'd have given at the Dayton, if invited. \$5 (#50)

Wayne Tampa Talk: This is the talk I gave at the Tampa Global Sciences conference—where I cover amateur radio, cold fusion, health, books you should read, and so on. \$5 (#51)

\$1 Million Sales Video: The secret of how you can generate an extra million dollars in sales just by using PR. This will be one of the best investments you or your business will ever make. \$40 (#52)

Reprints of My Editorials from 73. Very few things in this world are as we've been taught, and as they appear. I blow the whistle on the scams around us, such as the health care, our school system, our money, the drug war, a college education, sugar, the food giants, our unhealthy food, fluorides, EMFs, NutraSweet, etc.

1996 Editorials: 120 pages, 100 choice editorials. \$10 (#72)

1997 Editorials: 148 fun-packed pages. 216 editorials. \$10 (#74)

1998 Editorials: 168 pages that'll give you lots of controversial things to talk about on the air. \$10 (#75)

1999 Editorials: 132 pages of ideas, book reviews, health, education, and anything else I think you ought to know about. \$10 (#76)

2000 Editorials: In the works.

Silver Wire: With two 3-in. pieces of heavy pure silver wire + three 9V batteries you can make a thousand dollars' worth of silver colloid. What do you do with it? It does what the antibiotics do, but germs can't adapt to it. Use it to get rid of germs on food, for skin fungus, warts, and even to drink, Read some books on the uses of silver colloid, it's like magic. \$15 (#80)

Wayne's Bell Saver Kit. The cable and instructions enabling you to inexpensively tape Art Bell W6OBB's nightly 5-hr radio talk show. \$5 (#83) NH Reform Party Keynote Speech. It wow'd 'em when I laid out plans for NH in 2020, with much better, yet lower-cost schools, zero state taxes, far better health care, a more responsive state government, etc. \$1 (#85)

Stuff I didn't write, but you need: NASA Mooned America: René makes an air-tight case that NASA faked the Moon landings. This book

will convince even you. \$25 (#90)
Last Skeptic of Science: This is
René's book where he debunks a bunch
of accepted scientific beliefs – such as
the ice ages, the Earth being a magnet,
the Moon causing the tides, and etc. \$25
(#91)

Dark Moon: 568 pages of carefully researched proof that the Apollo Moon landings were a hoax—a capping blow for Řené's skeptics. \$35 (#92)

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